*Maxwell*
of
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# *ENCYCLOPÆDIA BRITANNICA;*
OR, A
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OF
# ARTS, SCIENCES,
AND
# MISCELLANEOUS LITERATURE;
Conſtructed on a PLAN,
BY WHICH
THE DIFFERENT SCIENCES AND ARTS
Are digeſted into the FORM of Diſtinct
TREATISES OR SYSTEMS,
COMPREHENDING
The HISTORY, THEORY, and PRACTICE, of each,
according to the Lateſt Diſcoveries and Improvements;
*AND FULL EXPLANATIONS GIVEN OF THE*
VARIOUS DETACHED PARTS OF KNOWLEDGE,
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throughout the WORLD;
A General HISTORY, *Ancient* and *Modern*, of the different Empires, Kingdoms, and States;
AND
An Account of the LIVES of the moſt Eminent Perſons in every Nation,
from the earlieſt ages down to the preſent times.

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*Compiled from the writings of the beſt Authors, in ſeveral languages; the moſt approved Dictionaries, as well of general ſcience as of its particular branches; the Tranſactions, Journals, and Memoirs, of Learned Societies, both at home and abroad; the MS. Lectures of Eminent Profeſſors on different ſciences; and a variety of Original Materials, furniſhed by an Extenſive Correſpondence.*

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VOL. VI.

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*INDOCTI DISCANT, ET AMENT MEMINISSE PERITI.*

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EDINBURGH.
PRINTED FOR A. BELL AND C. MACFARQUHAR.
MDCCXCVII.

# ENCYCLOPÆDIA BRITANNICA.

DIAMOND, a genus of earths of the ſiliceous kind, called *Adamas Gemma* by the Latins, *Demant* by the Germans and Swedes, and *Diamant* by the French, is the hardeſt of all ſtones hitherto diſcovered; commonly clear or tranſparent; though this property may perhaps belong only to the cryſtals, and not to the rock from which they originate. When brought to Europe in its rough ſtate, it is either in the form of roundiſh pebbles, with ſhining ſurfaces, or of octœdral cryſtals; but though they generally appear in octœdral forms, yet their cryſtals are frequently irregular, eſpecially when the ſurface inclines to cryſtallize during the ſhooting of the whole cryſtal, and alſo when ſeveral of them unite in one group; in which caſe the one hinders the other from aſſuming a regular form. Mr Magellan, however, informs us, that diamonds ſometimes aſſume other forms. He has ſeen a rough diamond in its native ſtate, of a regular cubical form, with its angles truncated or cut off; likewiſe another belonging to Dr Combe of London, whoſe ſquare ſides were naturally joined by two very narrow long facets, forming angles of about 120 degrees; and the corners were quite perfect.

Though the diamond is commonly clear and pellucid, yet ſome of them are met with of a roſe colour, or inclining to green, blue, or black, and ſome have black ſpecks. Tavernier ſaw one in the treaſury of the Mogul, with black ſpecks in it, weighing about 56 carats; and he informs us, that yellow and black diamonds are produced in the mines at Carnatica. Mr Dutens alſo relates, that he ſaw a black diamond at Vienna in the collection of the prince de Lichtenſtein. Some diamonds have a greeniſh cruſt; and of theſe M. Tavernier relates, that they burſt into pieces while working into a proper ſhape, or in the very act of poliſhing on the wheel. In confirmation of this, he mentions a large diamond worth upwards of 5000 l. Sterling, which burſt into nine pieces while poliſhing on the wheel at Venice.

The fineſt diamonds are thoſe of a complexion like that of a drop of pure water. It is likewiſe a valuable property if they are of a regular form and truly made; as alſo that they be free from ſtains, ſpots, ſpecks, flaws, and croſs veins. If diamonds are tinctured yellow, blue, green, or red, in a high degree, they are next in eſteem; but if they are tinctured with theſe colours only in a low degree, the value of them is greatly diminiſhed. There are alſo diamonds of other complexions; ſuch as brown, and thoſe of a dark hue: the firſt reſembling the browneſt ſugar-candy, and the latter duſky iron. In the *Philoſophical Commerce of Arts*, Dr Lewis tells us of a *black* diamond that he himſelf had ſeen. At a diſtance, it looked uniformly black; but on cloſer examination appeared in ſome parts tranſparent, and in others charged with foulneſs, on which the black hue depended.

Theſe gems are lamellated, conſiſting of very thin plates like thoſe of talc, but very cloſely united; the direction of which muſt be found out by lapidaries before they can work them properly: Such as have their foliated ſubſtance not in a flat poſition, are called by the workmen *diamonds of nature*.

The names of *oriental* and *occidental*, given by jewellers to this and all other precious ſtones, have a different meaning from the obvious ſenſe; the fineſt and hardeſt being always called *oriental*, whether they be produced in the eaſt or not. Thoſe called *occidental* are of inferior value; but according to Mr Jefferies, who has written a treatiſe on the ſubject, the diamonds of Braſil equal the fineſt oriental ones. The art of cutting theſe gems was invented in 1476 by Louis de Berquen a native of Bruges in the Auſtrian Netherlands. This ſtone becomes luminous in the dark, by expoſure during a certain time to the rays of the ſun; by heating it in a crucible; by plunging it in boiling water; or by rubbing it with a piece of glaſs. By friction it acquires an electrical property, by which it attracts the ſubſtance uſed for foils called *black maſtic*, and other light matters. The author of the Chemical Dictionary ſays, that diamonds are refractory in the fire, and even apyrous. Nevertheleſs, experiments have been made, which prove that diamonds are capable of being diſſipated, not only by the collected heat of the ſun, but alſo by the heat of a furnace. Mr Boyle ſays, that he perceived certain acrid and penetrating exhalations from diamonds expoſed to fire. A diamond by expoſure to a concave ſpeculum, the diameter of which was 40 inches, was reduced to an eighth part of its weight *. In the *Giornale de Letterati d' Italia, tom.* viii. *art.* 9. we may read a relation of experiments made on precious ſtones, by order of the grand duke of Tuſcany, with a burning lens, the diameter of which was two thirds of a Florentine ell, near the focus of which was placed another ſmaller lens. By theſe experiments we find, that diamonds were more altered by ſolar heat than moſt of the other precious ſtones, although not the leaſt appearance of a commencing fuſion was obſervable. A diamond weighing 30 grains, thus expoſed during 30 ſeconds, loſt its colour, luſtre, and tranſparency, and became of an opaque white. In five minutes, bubbles appeared on its ſurface; ſoon afterwards it burſt into pieces, which were diſſipated; and the ſmall fragment which remained was capable of being cruſhed into fine powder by the preſſure of the blade of a knife. Neither the addition of glaſs, flints, ſulphur, metals, or ſalt of tartar, prevented this diſſi-

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* *Philoſ. Tranſac.* n° 386.

pation of diamonds, or occaſioned any degree of fuſion. By this heat rubies were ſoftened, and loſt ſome of their colour, but preſerved their form and weight. By addition of a third lens, a further degree of fuſion was given to rubies. Even then rubies could not be made to unite with glaſs. By having been expoſed to this heat, the ſurface of the rubies which had ſuffered fuſion, loſt much of their original hardneſs, and were nearly as ſoft as cryſtal. But their internal parts, which had not been fuſed, retained their hardneſs. Emeralds by this heat were rendered white, or of various colours, and ſoon afterwards were fuſed. They were found to have loſt part of their weight, and to be rendered leſs hard and brittle.

Experiments were alſo made by order of the emperor Francis I. on precious ſtones; from which we find, that diamonds were entirely diſſipated by having been expoſed in crucibles to a violent fire of a furnace during 24 hours; while rubies by the ſame heat were not altered in weight, colour, or poliſh. By expoſing diamonds during two hours only at a time, the following alterations produced on them by fire were obſerved. Firſt, they loſt their poliſh; then they were ſplit into thin plates; and, laſtly, totally diſſipated. By the ſame fire, emeralds were fuſed. *See Magaſin de Hambourg, tom.* xviii.

The action of fire on diamonds has, notwithſtanding the above mentioned experiments, been lately doubted in France; and the queſtion has been agitated by ſeveral eminent chemiſts with much intereſt, and numerous experiments have been made which throw ſome light on the ſubject. M. D'Arcet found, not only that diamonds included in porcelain crucibles cloſe, or covered with perforated lids, and expoſed to the long and intenſe heat of a porcelain furnace, were perfectly diſſipated; but alſo, that theſe ſtones could in a few hours be totally volatiliſed with a much inferior degree of heat, by expoſing them in a coppel, under the muffle of an eſſay-furnace. In this latter experiment, he obſerved that the diſſipation was gradual, and that it was effected by a kind of exfoliation. The diſſipation of diamonds expoſed in coppels was confirmed by M. Macquer; who further obſerved, that the diamonds were, before the diſſipation began, rendered, by the fire, brilliant and ſhining, as it were, with a phoſphoric light. In order to determine whether the diſſipation of diamonds was actually effected by their reduction into vapour, or by a combuſtion or other effect of air upon them, Meſſrs Lavoiſier, Macquer, and Cadet, expoſed diamonds to intenſe heat in an earthen retort, during ſeveral hours, but without any other effect than that their poliſh was deſtroyed, and about $\frac{1}{7}$th of their weight diminiſhed. M. Mitouard put diamonds in a tobacco-pipe filled with pounded charcoal and accurately cloſed with lute. He further ſecured the diamonds from acceſs of air or flame, by placing the tobacco-pipe in a crucible, to which another crucible was inverted and carefully luted. The diamonds, thus ſecluded from external air, having been expoſed to the moſt intenſe heat which could be excited in a well conſtructed furnace, were not thereby altered or diminiſhed. M. Mitouard was induced to believe, that the charcoal conduced to the preſervation of diamonds not merely by excluding the air, but by ſome peculiar property, which he ſuppoſes may be the ſame as that by which this ſubſtance defends metals from deſtruction by fire. He was confirmed in his opinion, by obſerving that diamonds were not preſerved from the action of fire by ſurrounding them with powder of chalk and of calcined hartſhorn, and including them in cloſe veſſels, ſo well as when the charcoal had been employed. Some chemiſts even thought that the perfect excluſion of air alone was ſufficient to preſerve diamonds, and doubted whether the balls and crucibles of porcelain employed by M. D'Arcet had excluded the air with ſufficient accuracy. Indeed, in one of M. D'Arcet's own experiments, a diamond included in a ball of porcelain had reſiſted the action of fire. In order to aſcertain this queſtion, M. Cadet expoſed diamonds in covered and luted crucibles to the violent heat of a forge during two hours; by which operation the diamonds loſt only $\frac{1}{16}$th part of their weight. He infers, that the deſtruction of diamonds by fire in open veſſels is not a true volatilization; but merely an exfoliation, cauſed by the fire expanding the air contained between the thin plates of which theſe ſtones conſiſt, and that by this exfoliation or decrepitation theſe plates are reduced to ſo fine a powder as to eſcape obſervation. M. D'Arcet objected againſt the experiments of his adverſaries, that they were not of ſufficient duration to decide againſt his, which had laſted ſeveral days. He renewed and multiplied his experiments, which confirmed him in his opinion of the volatilization of diamonds in veſſels perfectly cloſed; and that this effect of fire on diamonds is not a mere exfoliation or mechanical ſeparation of the plates of which theſe ſtones conſiſt, he infers from the parts of the diamonds pervading the moſt ſolid porcelain crucibles without being perceptible, and from the luminous appearance firſt noticed by M. Macquer, and which was afterwards obſerved by M. Roux to be an actual flame.

Diamonds are found only in the Eaſt Indies, and in Braſil in South America. The diamond mines are found only in the kingdoms of Golconda, Viſapour, Bengal, and the iſland of Borneo. There are four mines, or rather two mines and two rivers, whence diamonds are drawn. The mines are, 1. That of Raolconda, in the province of Carnatica, five days journey from Golconda, and eight from Viſapour. It has been diſcovered about 200 years. 2. That of Gani, or Coulour, ſeven days journey from Golconda eaſtwardly. It was diſcovered 140 years ago by a peaſant, who digging in the ground found a natural fragment of 25 carats. 3. That of Soumelpour, a large town in the kingdom of Bengal, near the Diamond-mine. This is the moſt ancient of them all: it ſhould rather be called that of *Goual*, which is the name of the river, in the ſand whereof theſe ſtones are found. Laſtly, the fourth mine, or rather the ſecond river, is that of Succudan, in the iſland of Borneo.

*Diamond-Mine* of Raolconda.—In the neighbourhood of this mine the earth is ſandy, and full of rocks and copſe. In theſe rocks are found ſeveral little veins of half and ſometimes a whole inch broad, out of which the miners, with a kind of hooked irons, draw the ſand or earth wherein the diamonds are; breaking the rocks when the vein terminates, that the track may be found again, and continued. When a ſufficient quantity of earth or ſand is drawn forth, they waſh it two or three times, to ſeparate the ſtones therefrom.

from. The miners work quite naked, except for a thin linen cloth before them; and beſides this precaution, have likewiſe inſpectors, to prevent their concealing of ſtones: which, however, maugre all this care, they frequently find means to do, by watching opportunities when they are not obſerved, and ſwallowing them down.

*Diamond-Mine* of Gani or Coulour.—In this mine are found a great number of ſtones from 10 to 40 carats, and even more; and it was here that famous diamond of Aureng-Zeb the Great Mogul, which before it was cut weighed 793 carats, was found. The ſtones of this mine are not very clear; their water is uſually tinged with the quality of the ſoil; being black where that is marſhy, red where it partakes of red, ſometimes green and yellow, if the ground happen to be of thoſe colours. Another defect of ſome conſequence is a kind of greaſineſs appearing on the diamond, when cut, which takes off part of its luſtre. —There are uſually no leſs than 60,000 perſons, men, women, and children, at work in this mine.

When the miners have found a place where they intend to dig, they level another ſomewhat bigger in the neighbourhood thereof, and incloſe it with walls about two feet high, only leaving apertures from ſpace to ſpace, to give paſſage to the water. After a few ſuperſtitious ceremonies, and a kind of feaſt which the maſter of the mine makes for the workmen, to encourage them, every one goes to his buſineſs, the men digging the earth in the place firſt diſcovered, and the women and children carrying it off into the other walled round. They dig 12 or 14 feet deep, and till ſuch time as they find water. Then they ceaſe digging; and the water thus found ſerves to waſh the earth two or three times, after which it is let out at an aperture reſerved for that end. This earth being well waſhed, and well dried, they ſift it in a kind of open ſieve, or riddle, much as we do corn in Europe; then thraſh it, and ſift it afreſh; and laſtly, ſearch it well with the hands to find the diamonds. They work naked as in the mine of Raolconda, and are watched after the like manner by inſpectors.

*Diamond-Mine* of Soumelpour, or river Goual.—Soumelpour is a large town built all of earth, and covered with branches of cacao-trees: the river Goual runs by the foot thereof, in its paſſing from the high mountains towards the ſouth to the Ganges, where it loſes its name. It is from this river that all our fine diamond points, or ſparks, called *natural ſparks*, are brought. They never begin to ſeek for diamonds in this river till after the great rains are over, that is, after the month of December; and they uſually even wait till the water is grown clear, which is not before January. The ſeaſon at hand, eight or ten thouſand perſons, of all ages and ſexes, come out of Soumelpour and the neighbouring villages. The moſt experienced among them ſearch and examine the ſand of the river, going up it from Soumelpour to the very mountain whence it ſprings. A great ſign that there are diamonds in it, is the finding of thoſe ſtones which the Europeans call *thunder-ſtones*. When all the ſand of the river, which at that time is very low, has been well examined, they proceed to take up that wherein they judge diamonds likely to be found; which is done after the following manner: They dam the place round with ſtones, earth, and faſcines, and lading out the water, dig about two feet deep: the ſand thus got is carried into a place walled round on the bank of the river. The reſt is performed after the ſame manner as at Coulour, and the workmen are watched with equal ſtrictneſs.

*Diamond-Mine* in the iſland of Borneo, or river of Succudan.—We are but little acquainted with this mine; the queen who reigns in that part of the iſland not allowing ſtrangers to have any commerce in theſe ſtones: though there are very fine ones to be bought at Batavia, brought thither by ſtealth. They were anciently imagined to be ſofter than thoſe of the other mines; but experience ſhows they are in no reſpect inferior to them.

Beſide theſe four diamond-mines, there have been two others diſcovered; one of them between Coulour and Raolconda, and the other in the province of Carnatica; but they were both cloſed up almoſt as ſoon as diſcovered: that of Carnatica, becauſe the water of the diamonds was always either black or yellow; and the other, on account of their cracking, and flying in pieces when cut and ground.

The diamond, we have already obſerved, is the hardeſt of all precious ſtones. It can only be cut and ground by itſelf and its own ſubſtance. To bring it to that perfection which augments its price ſo conſiderably, they begin by rubbing ſeveral againſt each other, while rough; after having firſt glued them to the ends of two wooden blocks, thick enough to be held in the hand. It is this powder thus rubbed off the ſtones, and received in a little box for the purpoſe, that ſerves to grind and poliſh the ſtones.

Diamonds are cut and poliſhed by means of a mill, which turns a wheel of ſoft iron ſprinkled over with diamond-duſt mixed with oil of olives. The ſame duſt, well ground, and diluted with water and vinegar, is uſed in the ſawing of diamonds; which is performed with an iron or braſs wire, as fine as a hair. Sometimes, in lieu of ſawing the diamonds, they cleave them, eſpecially if there be any large ſhivers therein. But the Europeans are not uſually daring or expert enough to run the riſk of cleaving, for fear of breaking.

The *firſt water* in diamonds means the greateſt purity and perfection of their complexion, which ought to be that of the pureſt water. When diamonds fall ſhort of this perfection, they are ſaid to be of the *ſecond* or *third* water, &c. till the ſtone may be properly called a *coloured one:* for it would be an impropriety to ſpeak of an imperfectly coloured diamond, or one that has other defects, as a ſtone of a bad water only.

Mr Boyle has obſerved, from a perſon much converſant in diamonds, that ſome of theſe gems, in their rough ſtate, were much heavier than others of the ſame bigneſs, eſpecially if they were cloudy or foul; and Mr Boyle mentions one that weighed $8\frac{1}{2}$ grains, which being carefully weighed in water, proved to an equal bulk of that liquor as $2\frac{22}{23}$ to 1. So that, as far as could be judged by that experiment, a diamond weighs not thrice as much as water: and yet, in his table of ſpecific gravities, that of a diamond is ſaid to be to water as 3400 to 1000; that is, as $3\frac{2}{5}$ to 1; and therefore, according to theſe two accounts, there ſhould be ſome diamonds whoſe ſpecific gravity differs nearly $\frac{1}{8}$ from that of others. But this is a much greater difference than can be expected in two bodies of the ſame ſpecies; and indeed, on an accurate trial, does not prove to be the caſe with diamonds. The Braſil diamonds differ a little in weight one from another, and greatly vary from the ſtandard ſet by Mr Boyle for the ſpecific gravity of this gem in general; two large diamonds from that part of the world being carefully weighed, one was found as 3518, the other as 3521, the ſpecific gravity of water being reckoned 1000. After this, ten Eaſt India diamonds were choſen out of a large parcel, each as different from the other in ſhape, colour, &c. as could be found. Theſe being weighed in the ſame ſcales and water with the former, the lighteſt proved as 3512, the heavieſt as 3525, ſtill ſuppoſing the water to be 1000.—Mr Ellicot, who made theſe experiments, has drawn out a table of their ſeveral differences, which is done with great care and accuracy; and, taking in all the common varieties in diamonds, may ſerve as a general rule for their mean gravity and differences.

| | In air. | In water. | Specific gravity |
|---|---|---|---|
| Water - - - | | | 1000 |
| | *Grains.* | *Grains.* | |
| N° 1. A Braſil diamond, fine water and rough coat | 92,425 | 66,16 | 3518 |
| 2. Ditto, fine water, rough coat - - | 88,21 | 63,16 | 3521 |
| 3. Ditto, fine bright coat | 10,025 | 7,170 | 3511 |
| 4. Ditto, fine bright coat | 9,560 | 6,830 | 3501 |
| 5. An Eaſt India diamond, pale blue - - | 26,485 | 18,945 | 3512 |
| 6. Ditto, bright yellow - | 23,33 | 16,710 | 3524 |
| 7. Ditto, very fine water, bright coat - | 20,66 | 14,800 | 3525 |
| 8. Ditto, very bad water, honeycomb coat - | 20,38 | 14,590 | 3519 |
| 9. Ditto, very hard bluiſh caſt | 22,5 | 16,1 | 3515 |
| 10. Ditto, very ſoft, good water - - | 22,615 | 16,2 | 3525 |
| 11. Ditto, a very large red foulneſs in it - - | 25,480 | 18,230 | 3514 |
| 12. Ditto, ſoft, bad water | 29,525 | 21,140 | 3521 |
| 13. Ditto, ſoft, brown coat | 26,535 | 18,990 | 3516 |
| 14. Ditto, very deep green coat - - | 25,250 | 18,080 | 3521 |

The mean ſpecific gravity of the Braſil diamonds appears to be - - 3513
Of the Eaſt India diamonds - - - 3519
The mean of both - - - - 3517

Therefore if any thing is to be concluded as to the ſpecific gravity of the diamond, it is, that it is to water as 3517 to 1000.

For the valuation of diamonds of all weights, Mr Jefferies lays down the following rule. He firſt ſuppoſes the value of a rough diamond to be ſettled at 2 l. per carat, at a medium; then to find the value of diamonds of greater weights, multiply the ſquare of their weight by 2, and the product is the value required. *E. G.* to find the value of a rough diamond of two carats; 2×2=4, the ſquare of the weight; which, multiplied by two, gives 8 l. the true value of a rough diamond of two carats. For finding the value of manufactured diamonds, he ſuppoſes half their weight to be loſt in manufacturing them; and therefore, to find their value, we muſt multiply the ſquare of double their weight by 2, which will give their true value in pounds. Thus, to find the value of a wrought diamond weighing two carats; we firſt find the ſquare of double the weight, *viz* 4×4=16; then 16×2=32. So that the true value of a wrought diamond of two carats is 32 l. On theſe principles Mr Jefferies has conſtructed tables of the price of diamonds from 1 to 100 carats.

The greateſt diamond ever known in the world is one belonging to the king of Portugal, which was found in Braſil. It is ſtill uncut: and Mr Magellan informs us, that it was of a larger ſize; but a piece was cleaved or broken off by the ignorant countryman, who chanced to find this great gem, and tried its hardneſs by the ſtroke of a large hammer upon the anvil.

This prodigious diamond weighs 1680 carats: and although it is uncut, Mr Romè de l'Iſle ſays, that it is valued at 224 millions ſterling; which gives the eſtimation of 79,36 or about 80 pounds ſterling for each carat: *viz.* for the multiplicand of the ſquare of its whole weight. But even in caſe of any error of the preſs in this valuation, if we employ the general rule above mentioned, this great gem muſt be worth at leaſt 5,644,800 pounds ſterling, which are the product of 1680 by two pounds, *viz.* much above five millions and a half ſterling.

The famous diamond which adorns the ſceptre of the Empreſs of Ruſſia under the eagle at the top of it weighs 779 carats, and is worth at leaſt 4,854,728 pounds ſterling, although it hardly coſt 135,417 guineas. This diamond was one of the eyes of a Malabarian idol, named *Scheringham*. A French grenadier, who had deſerted from the Indian ſervice, contrived ſo well as to become one of the prieſts of that idol, from which he had the opportunity to ſteal its eye: he run away to the Engliſh at Trichinapeuty, and thence to Madras. A ſhip-captain bought it for twenty thouſand rupees: afterwards a Jew gave ſeventeen or eighteen thouſand pounds ſterling for it: at laſt a Greek merchant, named *Gregory Suffras*, offered it to ſale at Amſterdam in the year 1766: and the late prince Orloff made this acquiſition, as he himſelf told Mr Magellan in London, for his ſovereign the empreſs of Ruſſia. Dutens, page 19. and Bomare, page 389. of his Mineralogy, relate the above anecdote. The figure and ſize of this diamond may be ſeen in the Britiſh Muſeum in London: it is far from being of a regular form.

The diamond of the great Mogul is cut in Roſe; weighs $279\frac{9}{16}$ carats, and it is worth 380,000 guineas. This diamond has a ſmall flaw underneath near the bottom: and Tavernier, page 389. who examined it, valued the carat at 150 French livres. Before this diamond was cut, it weighed $793\frac{5}{8}$ carats, according to Romè de l'Iſle: but Tavernier, page 339. of his ſecond volume, ſays, that it weighed 900 carats before it was cut. If this is the very ſame diamond, its loſs by being cut was very extraordinary.

Another diamond of the king of Portugal, which weighs 215 carats, is extremely fine, and is worth at leaſt 369,800 guineas.

The diamond of the grand duke of Tuſcany, now of the emperor of Germany, weighs $139\frac{1}{2}$ carats; and is worth at leaſt 109,520 guineas. Tavernier ſays, that this diamond has a little hue of a citron colour; and he valued it at 135 *livres tournoiſes* the carat. Robert de Berquen ſays, that this diamond was cut into two: that the grand Turk had another of the ſame ſize: and that there were at Biſnagar two large diamonds, one of 250 and another of 140 carats. This Robert de Berquen was the grandſon of Louis de Berquen, who invented the art of cutting diamonds.

The diamond of the king of France, called the *Pitt* or *Regent*, weighs $136\frac{1}{2}$ carats: this gem is worth at leaſt 208,333 guineas, although it did not coſt above the half of this value.

The other diamond of the ſame monarch, called the *Sancy*, weighs 55 carats: it coſt 25,000 guineas: and Mr Dutens ſays, that it is worth much above that price.

*Brilliant* DIAMOND, is that cut in faces both at top and bottom; and whoſe table, or principal face at top, is flat. To make a complete ſquare brilliant, if the rough diamond be not found of a ſquare figure, it muſt be made ſo; and if the work is perfectly executed, the length of the axis will be equal to the ſide of the ſquare baſe of the pyramid.—Jewellers then form the table and collet by dividing the block, or length of the axis, into 18 parts. They take $\frac{5}{18}$ from the upper part, and $\frac{1}{18}$ from the lower. This gives a plane at $\frac{4}{18}$ diſtance from the girdle for the table; and a ſmaller plane at $\frac{5}{18}$ diſtance for the collet; the breadth of which will be $\frac{1}{5}$ of the breadth of the table. In this ſtate the ſtone is ſaid to be a *complete ſquare table* diamond.—The brilliant is an improvement on the table-diamond, and was introduced within the laſt century, according to Mr Jefferies.—To render a brilliant perfect, each corner of the above deſcribed table-diamond, muſt be ſhortened by $\frac{1}{20}$ of its original. The corner ribs of the upper ſides muſt be flattened, or run towards the centre of the table $\frac{1}{6}$ leſs than the ſides; the lower part, which terminates in the girdle, muſt be $\frac{1}{8}$ of one ſide of the girdle; and each corner rib of the under ſides muſt be flattened at the top, to anſwer the above flattening at the girdle, and at bottom muſt be $\frac{1}{4}$ of each ſide of the collet.

The parts of the ſmall work which completes the brilliant, or the ſtar and ſkill facets, are of a triangular figure. Both of theſe partake equally of the depth of the upper ſides from the table to the girdle; and meet in the middle of each ſide of the table and girdle, as alſo at the corners. Thus they produce regular lozenges on the four upper ſides and corners of the ſtone. The triangular facets, on the under ſides, joining to the girdle, muſt be half as deep again as the above facets, to anſwer to the collet part.—The ſtone here deſcribed is ſaid to be a *full-ſubſtanced brilliant*.—If the ſtone is thicker than in the proportion here mentioned, it is ſaid to be an *over-weighted brilliant*.—If the thickneſs is leſs than in this proportion, it is called a *ſpread-brilliant*.—The beauty of brilliants is diminiſhed from their being either over-weighted or ſpread. The true proportion of the axis, or depth of the ſtone to its ſide, is as 2 to 3.—Brilliants are diſtinguiſhed into ſquare, round, oval, and drops, from the figure of their reſpective girdles.

*Corniſh* DIAMOND, a name given by many people to the cryſtals found in digging the mines of tin in Cornwal. Theſe cryſtals are of the nature of the Kerry-ſtone of Ireland, but ſomewhat inferior to it: they are uſually bright and clear, except towards the root, where they are coarſe and foul, or whitiſh. They are uſually found in the common form of an hexangular column terminated at each end by an hexangular pyramid.

*Roſe*-DIAMOND is one that is quite flat underneath, with its upper part cut in divers little faces, uſually triangles, the uppermoſt of which terminate in a point.—In roſe-diamonds, the depth of the ſtone from the baſe to the point muſt be half the breadth of the diameter of the baſe of the ſtone. The diameter of the crown muſt be $\frac{2}{5}$ of the diameter of the baſe. The perpendicular, from the baſe to the crown, muſt be $\frac{3}{5}$ of the diameter of the ſtone. The lozenges which appear in all circular roſe-diamonds, will be equally divided by the ribs that form the crown; and the upper angles or facets will terminate in the extreme point of the ſtone, and the lower in the baſe or girdle.

*Rough* DIAMOND, is the ſtone as nature produces it in the mines.

A rough diamond muſt be choſen uniform, of a good ſhape, tranſparent, not quite white, and free of flaws and ſhivers. Black, rugged, dirty, flawey, veiny ſtones, and all ſuch as are not fit for cutting, they uſe to pound in a ſteel mortar made for that purpoſe; and when pulverized, they ſerve to ſaw, cut, and poliſh the reſt. Shivers are occaſioned in diamonds by this, That the miners, to get them more eaſily out of the vein, which winds between two rocks, break the rocks with huge iron levers, which ſhakes, and fills the ſtone with cracks and ſhivers. The ancients had two miſtaken notions with regard to the diamond: the firſt, that it became ſoft, by ſteeping it in hot goat's blood; and the ſecond, that it is malleable, and bears the hammer. Experience ſhows us the contrary; there being nothing capable of mollifying the hardneſs of this ſtone; tho' its hardneſs be not ſuch, that it will endure being ſtruck at pleaſure with the hammer.

*Factitious* DIAMONDS. Attempts have been made to produce artificial diamonds, but with no great ſucceſs.—Theſe made in France, called *temple diamonds*, on account of the temple at Paris, where the beſt of them are made, fall vaſtly ſhort of the genuine ones; accordingly they are but little valued, though the conſumption thereof is pretty conſiderable for the habits of the actors on the ſtage, &c. See PASTES.

DIAMOND, in the glaſs-trade, an inſtrument uſed for ſquaring the large plates or pieces; and, among glaziers, for cutting their glaſs.

Theſe ſorts of diamonds are differently fitted up. That uſed for large pieces, as looking-glaſſes, &c. is ſet in an iron ferril, about two inches long, and a quarter of an inch in diameter; the cavity of the ferril being filled up with lead, to keep the diamond firm: there is alſo a handle of box or ebony fitted to the ferril, for holding it by.

DIAMOND, in heraldry, a term uſed for expreſſing the black colour in the atchievements of peerage.

Guillim does not approve of blazoning the coats of peers by precious ſtones inſtead of metals and colours; but the Engliſh practice allows it. Morgan ſays the diamond is an emblem of fortitude.

DIANA, the goddeſs of hunting. According to

Cicero, there were three of this name: a daughter of Jupiter and Proſerpine, who became mother of Cupid; a daughter of Jupiter and Latona; and a daughter of Upis and Glauce. The ſecond is the moſt celebrated, and to her all the ancients allude. She was born at the ſame birth as Apollo; and the pains which ſhe ſaw her mother ſuffer during her labour gave her ſuch an averſion to marriage, that ſhe obtained of her father to live in perpetual celibacy, and to preſide over the travails of women. To ſhun the ſociety of men, ſhe devoted herſelf to hunting; and was always accompanied by a number of choſen virgins, who like herſelf abjured the uſe of marriage. She is repreſented with a quiver and attended with dogs, and ſometimes drawn in a chariot by two white ſtags. Sometimes ſhe appears with wings, holding a lion in one hand and a panther in the other, with a chariot drawn by two heifers, or two horſes of different colours. She is repreſented as tall; her face has ſomething manly; her legs are bare, well ſhaped, and ſtrong; and her feet are covered with a buſkin worn by huntreſſes among the ancients. She received many ſurnames, particularly from the places where her worſhip was eſtabliſhed, and from the functions over which ſhe preſided. She was called *Lucina*, *Ilythia*, or *Juno Pronuba*, when invoked by women in childbed; and *Trivia* when worſhipped in the croſs-ways, where her ſtatues were generally erected. She was ſuppoſed to be the ſame as the moon and Proſerpine or Hecate, and from that circumſtance ſhe was called *Triformis;* and ſome of her ſtatues repreſented her with three heads, that of a horſe, a dog, and a boar. Her power and functions under theſe three characters have been beautifully expreſſed in theſe two verſes:

*Terret, luſtrat, agit, Proſerpina, Luna, Diana,*
*Ima, ſuprema, feras, ſceptro, fulgore, ſagittâ.*

She was alſo called *Agrotera*, *Orithia*, *Taurica*, *Delia*, *Cynthia*, *Aricia*, &c. She was ſuppoſed to be the ſame as the Iſis of the Egyptians, whoſe worſhip was introduced into Greece with that of Oſiris under the name of Apollo. When Typhon waged war againſt the gods, Diana metamorphoſed herſelf into a cat to avoid his fury. She is generally known, in the figures that repreſent her, by the creſcent on her head, by the dogs which attend her, and by her hunting habit. The moſt famous of her temples was that of Epheſus, which was one of the ſeven wonders of the world: (See EPHESUS). She was there repreſented with a great number of breaſts, and other ſymbols which ſignified the earth or Cybele. Though ſhe was the patroneſs of chaſtity, yet ſhe forgot her dignity to enjoy the company of Endymion, and the very familiar favours which ſhe granted to Pan and Orion are well known: (See ENDYMION, PAN, ORION). The inhabitants of Taurica were particularly attached to the worſhip of this goddeſs, and they cruelly offered on her altar all the ſtrangers that were ſhipwrecked on their coaſts. Her temple in Aricia was ſerved by a prieſt who had always murdered his predeceſſor; and the Lacedemonians yearly offered her human victims till the age of Lycurgus, who changed this barbarous cuſtom for the ſacrifice of flagellation. The Athenians generally offered her goats; and others a white kid, and ſometimes a boar pig or an ox. Among plants, the poppy and the ditamy were ſacred to her. She, as well as her brother Apollo, had ſome oracles; among which thoſe of Egypt, Cilicia, and Epheſus, are the moſt known.

DIANÆ ARBOR, or ARBOR LUNÆ, in chemiſtry, the beautiful cryſtallizations of ſilver, diſſolved in aquafortis, to which ſome quickſilver is added: and ſo called from their reſembling the trunk, branches, leaves, &c. of a tree. See CHEMISTRY, n° 754.

*Dianæ Fanum*, (anc. geog.), a promontory of Bithynia: Now *Scutari*, a citadel oppoſite to Conſtantinople, on the eaſt ſide of the Boſporus Thracius.

*Dianæ Portus*, a port of Corſica, ſituated between Aleria and Mariana, on the eaſt ſide.

DIANDRIA (from δις *twice*, and ανηρ *a man*), the name of the ſecond claſs in Linnæus's ſexual ſyſtem, conſiſting of hermaphrodite plants; which, as the name imports, have flowers with two ſtamina or male organs.

The orders in this claſs are three, derived from the number of ſtyles or female parts. Moſt plants with two ſtamina have one ſtyle; as jeſſamine, lilac, privet, veronica, and baſtard alaternus: vernal graſs has two ſtyles; pepper, three.

DIANIUM (anc. geog.), a town of the Conteſtani, in the Hither Spain; famous for a temple of Diana, whence the name: Now *Denia*, a ſmall town of Valencia, on the Mediterranean. Alſo a promontory near Dianium: Now *El Cabo Martin*, four leagues from Denia, running out into the Mediterranean.

DIANTHERA, in botany: A genus of the monogynia order, belonging to the diandria claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ*. The corolla is ringent; the capſule bilocular, parting with a ſpring at the heel; the ſtamina each furniſhed with two antheræ placed alternately.—There is only one ſpecies, a native of Virginia and other parts of North America. It is a low herbaceous plant, with a perennial root, ſending out upright ſtalks a foot high, garniſhed with long narrow leaves of an aromatic odour, ſtanding cloſe to the ſtalks. From the ſide of the ſtalks the footſtalks of the flowers are produced, ſuſtaining ſmall ſpikes of flowers.—This plant is very difficult to be preſerved in Britain; for though it is hardy enough to live in the open air, it is very ſubject to rot in winter. It may be propagated by ſeeds ſown on a gentle hot-bed; and in the winter the plants muſt be kept in a dry ſtove.

DIANTHUS, CLOVE-GILLIFLOWER, CARNATION, PINK, SWEET-WILLIAM, &c.: A genus of the digynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 22d order, *Caryophyllei*. The calyx is cylindrical and monophyllous, with four ſcales at the baſe. There are five petals, with narrow heels; the capſule is cylindrical and unilocular.—There are a great number of ſpecies; but not more than four that have any conſiderable beauty as garden-flowers, each of which furniſhes ſome beautiful varieties. 1. The caryophyllus, or clove-gilliflower, including all the varieties of carnation. It riſes with many ſhort trailing ſhoots from the root, garniſhed with long, very narrow, evergreen leaves; and amidſt them upright ſlender flower-ſtalks, from one to three feet high, emitting many ſide-ſhoots; all of which, as well as the main ſtalk, are terminated by large ſolitary flowers, having ſhort oval ſcales to the calyx, and crenated petals. The varieties of this are very nume-

Dianthus. rous, and unlimited in the diverſity of flowers. 2. The deltoides, or common pink, riſes with numerous ſhort leafy ſhoots crowning the root, in a tufted head cloſe to the ground, cloſely garniſhed with ſmall narrow leaves; and from the ends of the ſhoots many erect flower-ſtalks, from about ſix to 15 inches high, terminated by ſolitary flowers of different colours, ſingle and double, and ſometimes finely variegated. This ſpecies is perennial, as all the varieties of it commonly cultivated alſo are. 3. The Chinenſis, Chineſe, or Indian pink, is an annual plant with upright firm flower-ſtalks, branching erect on every ſide, a foot or 15 inches high, having all the branches terminated by ſolitary flowers of different colours and variegations, appearing from July to November. 4. The barbatus, or bearded dianthus, commonly called *ſweet-william*. This riſes with many thick leafy ſhoots, crowning the root in a cluſter cloſe to the ground; garniſhed with ſpear-ſhaped evergreen leaves, from half an inch to two inches broad. The ſtems are upright and firm, branching erect two or three feet high, having all the branches and main ſtem crowned by numerous flowers in aggregate cluſters of different colours and variegations.

*Culture.* Though the carnations grow freely in almoſt any garden earth, and in it produce beautiful flowers, yet they are generally ſuperior in that of a light loamy nature: and of this kind of ſoil the floriſts generally prepare a kind of compoſt in the following manner, eſpecially for thoſe fine varieties which they keep in pots. A quantity of loamy earth muſt be provided, of a light ſandy temperature, from an upland or dry paſture-field or common, taking the top ſpit turf and all, which muſt be laid in a heap for a year, and turned over frequently. It muſt then be mixed with about one-third of rotten dung of old hotbeds, or rotten neats dung, and a little ſea-ſand, forming the whole into a heap again, to lie three, four, or ſix months, at which time it will be excellent for uſe; and if one parcel or heap was mixed with one of theſe kinds of dungs, and another parcel with the other, it will make a change, and may be found very beneficial in promoting the ſize of the flowers. This compoſt, or any other made uſe of for the purpoſe, ſhould not be ſifted, but only well broken with the ſpade and hands.—When great quantities of carnations are required, either to furniſh large grounds, or for market, or when it is intended to raiſe new varieties, it is eaſily effected by ſowing ſome ſeed annually in ſpring, in common earth, from which the plants will riſe abundantly. Several good varieties may alſo be expected from the plants of each ſowing; and poſſibly not one exactly like thoſe from which the ſeed was ſaved. The ſingle flowers are always more numerous than the double ones; but it is from the latter only that we are to ſelect our varieties. The ſeaſon for ſowing the ſeed is any time from the 20th of March to the 15th of April. —The plants generally come up in a month after ſowing: they muſt be occaſionally weeded and watered till July, when they will be fit for tranſplanting into the nurſery beds. Theſe beds muſt be made about three feet wide, in an open ſituation; and taking advantage of moiſt weather, prick the plants therein four inches aſunder, and finiſh with a gentle watering, which repeat occaſionally till the plants have taken good root. Here they muſt remain till September, when they will be ſo well advanced in growth as to require more room; and ſhould then have their final tranſplantation into other three feet wide beds of good earth, in rows 9 inches aſunder, where they are to be placed in the order of quincunx. Here they are to remain all winter, until they flower, and have obtained an increaſe of the approved varieties of doubles by layers; and until this period, all the culture they require is, that if the winter ſhould prove very ſevere, an occaſional ſhelter of mats will be of advantage. In ſpring, the ground muſt be looſened with a hoe; they muſt be kept clear from weeds; and when the flower-ſtalks advance, they are to be tied up to ſticks, eſpecially all thoſe that promiſe by their large flower-pods to be doubles.

Dianthus. The only certain method of propagating the double varieties is by layers. The proper parts for layers are thoſe leafy ſhoots ariſing near the crown of the root, which, when about five, ſix, or eight inches long, are of a proper degree of growth for layers. The general ſeaſon for this work is June, July, and the beginning of Auguſt, as then the ſhoots will be arrived at a proper growth for that operation; and the ſooner it is done after the ſhoots are ready the better, that they may have ſufficient time to acquire ſtrength before winter: theſe laid in June and July will be fit to take off in Auguſt and September, ſo will form fine plants in the month of October. The method of performing the work is as follows. Firſt provide a quantity of ſmall hooked ſticks for pegs. They muſt be three or four inches long, and their uſe is to peg the layers down to the ground. Get ready alſo in a barrow a quantity of light rich mould, to raiſe the earth, if neceſſary, round each plant, and provide alſo a ſharp penknife. The work is begun by ſtripping off all the leaves from the body of the ſhoots, and ſhortening thoſe at top an inch or two evenly. Then chooſing a ſtrong joint on the middle of the ſhoot or thereabouts, and on the back or under ſide thereof, cut with the penknife the joint half-way through, directing your knife upward ſo as to ſlit the joint up the middle, almoſt to the next joint above, by which you form a kind of tongue on the back of the ſhoot; obſerving that the ſwelling ſkinny part of the joint remaining at the bottom of the tongue muſt be trimmed off, that nothing may obſtruct the iſſuing of the fibres; for the layers always form their roots at that part. This done, looſen the earth about the plant; and, if neceſſary, add ſome freſh mould, to raiſe it for the more ready reception of the layers; then with your finger make a hollow or drill in the earth to receive the layer; which bend horizontally into the opening, raiſing the top upright, ſo as to keep the gaſh or ſlit part of the layer open; and, with one of the hooked ſticks, peg down the body of the layer, to ſecure it in its proper place and poſition, ſtill preſerving the top erect and the ſlit open, and draw the earth over it an inch or two, bringing it cloſe about the erect part of the ſhoot; and when all the ſhoots of each plant are thus laid, give directly ſome water to ſettle the earth cloſe, and the work is finiſhed. In dry weather the waterings muſt be often repeated, and in five or ſix weeks the layers will have formed good roots. They muſt then be ſeparated with a knife from the old plant, gently raiſed out of the earth with the point of a knife or trowel, in order to preſerve the fibrous roots of the layers as en-

tire

tire as poſſible; and when thus taken up, cut off the naked ſticky part at bottom cloſe to the root, and trim the tops of the leaves a little. They are then ready for planting either into beds or pots. In November the fine varieties in pots ſhould be moved to a ſunny ſheltered ſituation for the winter; and if placed in a frame, to have occaſional protection from hard froſt, it will be of much advantage. In the latter end of February, or ſome time in March, the layers in the ſmall pots, or ſuch as are in beds, ſhould be tranſplanted with balls into the large pots, where they are to remain for flower. To have as large flowers as poſſible, curious floriſts clear off all ſide-ſhoots from the flower-ſtem, ſuffering only the main or top buds to remain for flowering. When the flowers begin to open, attendance ſhould be given to aſſiſt the fine varieties, to promote their regular expanſion, particularly the largeſt kinds called *burſters*, whoſe flowers are ſometimes three or four inches diameter. Unleſs theſe are aſſiſted by art, they are apt to burſt open on one ſide, in which caſe the flower will become very irregular: therefore, attending every day at that period, obſerve, as ſoon as the calyx begins to break, to cut it a little open at two other places in the indenting at top with narrow-pointed ſciſſars, and hereby the more regular expanſion of the petals will be promoted: obſerving, if one ſide of any flower comes out faſter than another, to turn the pot about, that the other ſide of the flower may be next the ſun, which will alſo greatly promote its regular expanſion. When any fine flower is to be blown as large and ſpreading as poſſible, floriſts place ſpreading paper collars round the bottom of the flowers, on which they may ſpread their petals to the utmoſt expanſion. Theſe collars are made of ſtiff white paper, cut circular about three or four inches over, having a hole in the middle to receive the bottom of the flower, and one ſide cut open to admit it. This is to be placed round the bottom of the petals in the inſide of the calyx, the leaves of which are made to ſpread flat for its ſupport. The petals muſt then be drawn out and ſpread upon the collar to their full width and extent; the longeſt ones undermoſt, and the next longeſt upon theſe; and ſo on; obſerving that the collar muſt no where appear wider than the flower; and thus a carnation may be rendered very large and handſome.

Theſe directions will anſwer equally well for the propagation of the pinks and ſweet-williams, though neither of theſe require ſuch nicety in their culture as the carnations.

DIAPASON, in muſic, a muſical interval, by which moſt authors who have wrote on the theory of muſic uſe to expreſs the OCTAVE of the Greeks.

DIAPASON, among the muſical inſtrument-makers, a kind of rule or ſcale whereby they adjuſt the pipes of their organs, and cut the holes of their hautboys, flutes, &c. in due proportion for performing the tones, ſemitones, and concords, juſt.

*DIAPASON-Diaex*, in muſic, a kind of compound concord, whereof there are two ſorts; the greater, which is in the proportion of 10-3; and the leſſer, in that of 16-5.

*DIAPASON Diapente*, in muſic, a compound conſonance in a triple ratio, as 3-9. This interval, ſays Martianus Capella, conſiſts of 9 tones and a ſemitone; 19 ſemitones, and 38 dieſes. It is a ſymphony made when the voice proceeds from the firſt to the twelfth ſound.

*DIAPASON Diateſſaron*, in muſic, a compound concord founded on the proportion of 8 to 3. To this interval Martianus Capella allows 8 tones and a ſemitone; 17 ſemitones, and 34 dieſes. This is when the voice proceeds from its firſt to its eleventh ſound. The moderns would rather call it the *eleventh*.

*DIAPASON Ditone*, in muſic, a compound concord, whoſe terms are as 10-4, or as 5-2.

*DIAPASON Semiditone*, in muſic, a compound concord, whoſe terms are in the proportion of 12-5.

DIAPEDESIS, in medicine, a tranſudation of the fluids through the ſides of the veſſels that contain them, occaſioned by the blood's becoming too much attenuated, or the pores becoming too patent.

DIAPENTE, in the ancient muſic, an interval marking the ſecond of the concords, and with the diateſſaron an octave. This is what in the modern muſic is called a *fifth*.

DIAPHANOUS, an appellation given to all tranſparent bodies, or ſuch as tranſmit the rays of light.

DIAPHORESIS, in medicine, an elimination of the humours in any part of the body through the pores of the ſkin. See PERSPIRATION.

DIAPHORETICS, among phyſicians, all medicines which promote perſpiration.

DIAPHRAGM, DIAPHRAGMA, in anatomy, a part popularly called the *midriff*, and by anatomiſts *ſeptum tranſverſum*. It is a nervous muſcle, ſeparating the breaſt or thorax from the abdomen or lower venter, and ſerving as a partition between the natural and the vital parts, as they are called. See ANATOMY, n° 115.

It was Plato, as Galen informs us, that firſt called it *diaphragm*, from the verb διαφραττειν, *to ſeparate* or *be between two*. Till his time it had been called φρενες, from a notion that an inflammation of this part produced phrenſy; which is not at all warranted by experience, any more than that other tradition, that a tranſverſe ſection of the diaphragm with a ſword cauſes the patient to die laughing.

DIAPORESIS, Διαπορησις, in rhetoric, is uſed to expreſs the heſitation or uncertainty of the ſpeaker.

We have an example in Homer, where Ulyſſes, going to relate his ſufferings to Alcinous, begins thus:

Τι πρωτον, τι δ' επειτα, τι δ' υϛατιον καταλεξω?
*Quid primum, quid deinde, quid poſtremo alloquar?*

This figure is moſt naturally placed in the exordium or introduction to a diſcourſe. See DOUBTING.

DIARBECK, or DIARBEKR, an extenſive province of Eaſtern Aſiatic Turky; comprehending, in its lateſt extent, *Diarbekr*, properly ſo called, *Yerack* or *Chaldea*, and *Curdiſtan*, which were the ancient countries of Meſopotamia, Chaldea, and Aſſyria, with Bybylon. It is called *Diarbeck*, *Diarbeker*, or *Diarbekr*, as ſignifying the "duke's country," from the word *dhyar* "a duke, and *bekr* "country." It extends along the banks of the Tigris and Euphrates from north-north-weſt to ſouth-eaſt, that is, from Mount Taurus, which divides it from Turcomania on the north, to the inmoſt receſs of the Perſian gulph on the ſouth, about 600 miles; and from eaſt to weſt, that is, from Perſia on the eaſt to Syria and Arabia Deſerta on the weſt, in ſome places 200, and in others about 300, miles, but in the ſouthern or lower parts not above 150. As extending alſo from the 30th to the 38th degree of latitude, it lies under part of the fifth and ſixth climates whoſe longeſt day is about 14 hours and a half, and ſo in proportion, and conſequently enjoys a good temperature of air, as well as, in the greater part of it, a rich and fertile ſoil. There are indeed, as in all hot countries, ſome large deſerts in it, which produce no ſuſtenance for men or cattle, nor have any inhabitants. Being a conſiderable frontier towards the kingdom of Perſia, it is very well guarded and fortified; but as for thoſe many cities once ſo renowned for their greatneſs and opulence, they are at preſent almoſt dwindled into heaps of ruins. Bagdad, Moſſul, Carahmed, and a few more, indeed continue to be populous and wealthy; but the reſt can ſcarce be called by any other name than that of ſorry places. The rivers Euphrates and Tigris have almoſt their whole courſe through this country.

*Diarbeck Proper* is bounded on the north by Turcomania, on the weſt by Syria, on the ſouth by part of Arabia Deſerta and Yrack Proper, and on the eaſt by Curdiſtan. It was named by Moſes *Padan Aram*; the latter being the general name of Syria; and the former ſignifying *fruitful*, a proper epithet for this country, which is really ſo to a very high degree, eſpecially on the northern ſide, where it yields corn, wine, oil, fruits, and all neceſſaries of life in great abundance. Formerly it was the reſidence of many famed patriarchs, yet was over-run with the groſſeſt idolatry, not only in the time of Abraham's coming out of it, and Jacob's ſojourning in it, but likewiſe during the time it continued under the dominion of the Aſſyrians, Babylonians, Medes, Perſians, and Romans. It received indeed the light of the goſpel ſoon after our Saviour's aſcenſion, from St Thaddæus, who is ſaid to have been ſent thither by St Thomas, at the requeſt of Agbarus king of Edeſſa. This account, together with that monarch's letter to Jeſus Chriſt, we have from Euſebius, who took it from the archives of that city; and the whole had paſſed current and uncontradicted for many ages, till our more enlightened moderns found reaſons to condemn it; but whether right or wrong, it plainly appears that Chriſtianity flouriſhed here in a moſt eminent manner, till its purity was ſullied about the beginning of the ſixth century by the hereſy of the Jacobites, whoſe patriarch ſtill reſides here, with a juriſdiction over all that ſect in the Turkiſh dominions.

Diarbeck Proper, is a beglerbegate, under which are reckoned twelve ſangiacs; and the principal towns in it are, Diarbekir or Caramed, Rika, Mouſſul, Orfa or Edeſſa, Elbir, Niſibis, Gezir Merdin, Zibin, Ur of the Chaldees, Amad, and Caraſara; but all now of little note excepting Diarbekir and Mouſſul.

DIARBEKIR, the capital of the above diſtrict, is ſituated in a delightful plain, on the banks and near the head of the Tigris, about 155 miles or 15 caravan days journey, north-eaſt from Aleppo, in latitude 37° 35′, eaſt longitude 40° 50′. The bridge of 10 arches over the ſaid river is ſaid to have been built by the order of Alexander the Great. It is one of the richeſt and moſt mercantile cities in all Aſiatic Turkey; and is well fortified, being encompaſſed with a double wall, the outermoſt of which is flanked, with 72 towers, ſaid to have been raiſed in memory of our Saviour's 72 diſciples. It has ſeveral ſtately piazzas or market-places, well ſtored with all kinds of rich merchandize, and 12 magnificient moſques, ſaid to have been formerly Chriſtian churches. Its chief manufacture is the dreſſing, tanning, and dying of goat-ſkins, commonly called *Turkey leather*, of which the vent is almoſt incredible in many parts of Europe and Aſia: beſides this, there is another of dyed fine linen and cotton cloths, which are nearly in the ſame requeſt. The waters of the Tigris are reckoned extraordinary for thoſe two branches of trade, and give red leather a finer grain and colour than any other. There is a good number of large and convenient inns on both ſides of the river, for the caravans that go to and from Perſia; and on the road near the town is a chapel with a cupola, where Job is ſaid to lie buried. This place is much frequented by pilgrims of all nations and religions, and a Turkiſh hermit has a cell cloſe to it. The fair ſex, who, in moſt other parts of the Turkiſh empire, are kept quite immured, and conſidered as mere ſlaves, enjoy here an extraordinary liberty, and are commonly ſeen on the public walks of the city in company with the Chriſtian women, and live in great friendſhip and familiarity with them. The ſame is ſaid of the men, who are polite, affable, and courteous, and very different from what they affect to be, eſpecially the Turks, in other cities of this empire. The city is under the government of a baſha, who has great power and very large dominions. He has commonly a body of 20,000 horſe under him, for repelling the frequent incurſions of the Curdes and Tartars, who always go on horſeback to rob the caravans. The adjacent territory is very rich and beautiful; the bread, wine, and fleſh excellent; the fruits exquiſite, and the pigeons better and larger than any in Europe.

Mr Ives, who paſſed through this city in 1758, informs us, that "about two years ago it was very populous, its inhabitants amounting to 400,000 ſouls; but in the laſt year 300,000 died either by cold or famine. The Chriſtians reſiding in the city before this calamity were reckoned to amount to 26,000, of whom 20,000 died. This account we had from one of the French miſſionaries, a capuchin, who alſo ſaid, that before the famine the city contained 60,000 fighting men, but that now they are not able to muſter 10,000. He aſſures us, that the houſes and ſtreets, nay the very moſques, were filled with dead; that every part of the city exhibited a dreadful image of death; and that the ſurviving inhabitants not only greedily devoured all kinds of beaſts, brutes, and reptiles, but alſo were obliged to feed on human bodies. Yet, in the midſt of this ſcene of horror, the grandees of the city had every thing in plenty; for they had taken care to monopolize vaſt quantities of corn, which they ſold out to the other inhabitants at moſt extravagant prices, and thereby acquired for themſelves immenſe fortunes. Corn roſe from two piaſtres a meaſure to 50, 60, and even 70, in the ſpace of ſix months. The father added, that the very ſevere winter of 1756, and the locuſts in 1757, were the cauſes of this dreadful viſitation: for by reaſon of the former, there were but few acres of land ſown with corn; and by the latter, the ſmall crop they had was in a great meaſure deſtroyed. He ſpoke of the ſeverity of that winter in terms almoſt incredible: that it was common to ſee the people fall down dead in the ſtreets; that he himſelf once on quitting a warm room, and going into the open air, fell down motionleſs; and that his brother, in attempting to aſſiſt him, met with the ſame fate." This account of the effects of cold in the city of Diarbekir, which lies only in about 38° north, ſeems at firſt very ſurpriſing: but conſidering that the place ſtands on a riſing ground in the midſt of an extenſive plain, and that the high Courdiſtan mountains lie to the ſouth and eaſt of it, and the Armenian or Turcomanian to the north, whoſe heads are always covered with ſnow, and even now in July ſupply the city with ice; it will not appear at all improbable, that in a very ſevere winter, ſuch as was that in 1756, the inhabitants of this city ſhould ſo ſeverely feel the effects of it. Beſides, fuel muſt have been extremely ſcarce, eſpecially among the poorer ſort, as nothing of this kind is produced but upon the mountains, and theſe lie at ſuch a diſtance that the price of it muſt thereby be greatly enhanced.

DIARRHŒA, or LOOSENESS, in medicine, is a frequent and copious evacuation of liquid excrement by ſtool. See (the *Index* ſubjoined to) MEDICINE.

DIARTHROSIS, in anatomy, a kind of articulation or juncture of the bones; which being pretty lax, affords room for a manifeſt motion. The word comes from δια, and αρθρον, *juncture, aſſemblage*. It is oppoſed to *ſynarthroſis*, wherein the articulation is ſo cloſe that there is no ſenſible motion at all. See ANATOMY, n° 2.

DIARY, a term ſometimes uſed for a journal or day-book, containing an account of every day's proceedings. Thus we ſay, *diaries of the weather*, &c.

*DIARY Fever*, is a fever of one day. See EPHEMERA.

DIASCHISM, among muſicians, denotes the difference between the comma and enharmonic dieſis, commonly called the *leſſer comma*.

DIASCORDIUM, in pharmacy, a celebrated compoſition, ſo called from *ſcordium*, one of its ingredients. See PHARMACY.

DIASTOLE, among phyſicians, ſignifies the dilatation of the heart, auricles, and arteries; and ſtands oppoſed to the SYSTOLE, or contraction of the ſame parts. See ANATOMY, n° 124.

DIASTOLE, in grammar, a figure in proſody whereby a ſyllable naturally ſhort is made long. Such is the firſt ſyllable of *Priamides* in the following verſe of Virgil:

*Atque hic Priamides! nihil o tibi, amice, relictum.*

DIASYRMUS, in rhetoric, a kind of hyperbole, being an exaggeration of ſome low, ridiculous thing.

DIATESSARON, among ancient muſicians, a concord or harmonical interval, compoſed of a greater tone, a leſs tone, and one greater ſemitone: its proportion in numbers is as 4 : 3.

DIATONICK, in muſic, (compounded of two Greek words, *viz.* the prepoſition δια, ſignifying a tranſition from one thing to another, and the ſubſtantive τονος, importing a given degree of tenſion or muſical note), is indifferently applied to a ſcale or gammut, to intervals of a certain kind, or to a ſpecies of muſic, whether in melody or harmony, compoſed of theſe intervals. Thus we ſay the *diatonick* ſeries, a *diatonick* interval, *diatonick* melody or harmony. As the diatonick ſcale forms the ſyſtem of diatonick muſic, and conſiſts of diatonick intervals, it will be neceſſary, for underſtanding the former, that we ſhould explain the latter. See INTERVAL.

DIATRAGACANTH, in pharmacy, a name applied to certain powders, of which gum tragacanth is the chief ingredient.

DIAUGOPHRAGMIA, in natural hiſtory, a genus of foſſils of the order of ſeptariæ, whoſe partitions or ſepta, conſiſt of ſpar with an admixture of cryſtal. Of this genus there are three ſpecies. 1. A red kind, with browniſh yellow partitions. 2. A browniſh yellow kind, with whitiſh partitions. 3. A bluiſh-white kind, with ſtraw-coloured partitions.

DIBBLE, or DIBBER, a ſimple but uſeful implement in gardening, uſed for planting out all ſorts of young plants, &c.

DIBBLING WHEAT. See AGRICULTURE, n° 126—129.

DIBIO, or DIVIO (anc. geog.), the *Divionenſe Caſtrum*, and the *Divionum* of the lower age; a town of the Lingones, in Gallia Belgica: *Dibionenſes*, the people. Now *Dijon*, the capital of Burgundy. E. Long. 5. 5. N. Lat. 47. 15.

DICE, among gameſters, certain cubical pieces of bone or ivory, marked with dots on each of their faces, from one to ſix, according to the number of faces.

Sharpers have ſeveral ways of falſifying dice. 1. By ſticking a hog's briſtle in them, ſo as to make them run high or low as they pleaſe. 2. By drilling and loading them with quickſilver: which cheat is found out by holding them gently by two diagonal corners: for if falſe, the heavy ſides will turn always down. 3. By filing and rounding them. But all theſe ways fall far ſhort of the art of the dice-makers; ſome of whom are ſo dexterous this way, that your ſharping gameſters will give any money for them.

Dice formerly paid 5 s. every pair imported, with an additional duty of 4 s. $9\frac{45}{100}$ d. for every 20 s. value upon oath; but are now prohibited to be imported.

DICÆARCHUS, a ſcholar of Ariſtotle, compoſed a great number of books which were much eſteemed. Cicero and his friend Pomponius Atticus valued him highly. He wrote a book to prove, that men ſuffer more miſchief from one another than from all evils beſide. And the work he compoſed concerning the republic of Lacedemon was extremely honoured, and read every year before the youth in the aſſembly of the ephori. Geography was one of his principal ſtudies, on which ſcience there is a fragment of a treatiſe of his ſtill extant, and preſerved among the *Veteris geographiæ ſcriptores minores*.

DICHOTOMOUS, in botany. See BOTANY, p. 442, n° 41.

DICHOTOMY, a term uſed by aſtronomers for that phaſis or appearance of the moon, wherein ſhe is biſected, or ſhows juſt half her diſk. In this ſituation the moon is ſaid to be in a quadrate aſpect, or to be in her quadrature.

DICKER, in old writers, denotes the quantity of ten hides of ſkins, whereof 20 made a laſt: alſo 10 pair of gloves, ten bars of iron, and the like, are ſometimes expreſſed by the term *dicker*.

DICKINSON (Edmund), a celebrated Engliſh phyſician and chemiſt, born in 1624. He ſtudied and took

took his degrees at Merton-college, Oxford; and in 1655 publiſhed there his *Delphi Phœnicizantes*, &c. a moſt learned piece, in which he attempted to prove, that the Greeks borrowed the ſtory of the Pythian Apollo, and all that rendered the oracle at Delphos famous, from the Holy Scriptures, and the book of Joſhua in particular: a work that procured him great reputation both at home and abroad. He practiſed phyſic firſt at Oxford; but removing to London in 1684, his good fortune in recovering the earl of Arlington from a dangerous ſickneſs, procured his promotion to be phyſician in ordinary to Charles II. and to his houſehold. As that prince underſtood and loved chemiſtry, Dr Dickinſon grew into great favour at court; and was continued in his appointments under James. II. After the abdication of his unfortunate maſter, being then in years, and afflicted with the ſtone, he retired from practice, and died in 1707. He publiſhed many other things, particularly *Phyſica vetus & vera*, &c. containing a ſyſtem of philoſophy chiefly framed on principles collected from the Moſaic hiſtory.

DICTAMNUS, WHITE DITTANY, or *Fraxinella*: A genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 26th order, *Multiſiliquæ*. The calyx is pentaphyllous; the petals are five, and patulous; the filaments ſprinkled with glandulous points; the capſules five, coalited. There is only one ſpecies. It hath thick, penetrating, perennial roots, collected into a head at top, ſending up erect ſtalks annually, two or three feet high, garniſhed with pinnated alternate leaves, of three or four pair of oblong ſtiff lobes, terminated by an odd one; and the ſtalks crowned by long, pyramidal, looſe ſpikes of flowers, of white, red, and purple colours. They are very ornamental plants, and ſucceed in any of the common borders. The dittany which grows in Crete, Dalmatia, and the Morea, forms an article in the materia medica. The leaves, which are the only parts uſed, are imported from Italy. The beſt ſort are well covered over with a thick white down, and now and then intermixed with purpliſh flowers. In ſmell and taſte they ſomewhat reſemble lemon-thyme, but have more of an aromatic flavour, as well as a greater degree of pungency; when freſh, they yield a conſiderable quantity of an excellent eſſential oil.

DICTATOR, a magiſtrate at Rome inveſted with regal authority. This officer was firſt choſen during the Roman wars againſt the Latins. The conſuls being unable to raiſe forces for the defence of the ſtate, becauſe the plebeians refuſed to inliſt if they were not diſcharged of all the debts they had contracted with the patricians, the ſenate found it neceſſary to elect a new magiſtrate with abſolute and uncontroulable power to take care of the ſtate. The dictator remained in office for ſix months, after which he was again elected if the affairs of the ſtate ſeemed to be deſperate; but if tranquillity was re-eſtabliſhed, he generally laid down his power before the time was expired. He knew no ſuperior in the republic, and even the laws were ſubjected to him. He was called dictator, becauſe *dictus*, named by the conſul, or *quoniam dictis ejus parebat populus*, becauſe the people implicitly obeyed his command. He was named by the conſul in the night *viva voce*, and his election was confirmed by the auguries. As his power was abſolute, he could proclaim war, levy forces, conduct them againſt an enemy, and diſband them at his pleaſure. He puniſhed as he pleaſed, and from his deciſion there lay no appeal, at leaſt till later times. He was preceded by 24 lictors with the *faſces*; during his adminiſtration, all other officers, except the tribunes of the people, were ſuſpended, and he was the maſter of the republic. But amidſt all this independence, he was not permitted to go beyond the borders of Italy, and he was always obliged to march on foot in his expeditions, and he never could ride in difficult and laborious marches without previouſly obtaining a formal leave from the people. He was choſen only when the ſtate was in imminent dangers from foreign enemies or inward ſeditions. In the time of a peſtilence a dictator was ſometimes elected, as alſo to hold the *comitia*, or to celebrate the public feſtivals, or drive a nail in the capitol, by which ſuperſtitious ceremony the Romans believed that a plague could be averted, or the progreſs of an enemy ſtopped. This office, ſo reſpectable and illuſtrious in the firſt ages of the republic, became odious by the perpetual uſurpations of Sylla and J. Cæſar; and after the death of the latter, the Roman ſenate paſſed a decree which for ever after forbad a dictator to exiſt in Rome. The dictator, as ſoon as elected, choſe a ſubordinate officer called his maſter of horſe, *magiſter equitum*. This officer was reſpectable; but he was totally ſubſervient to the will of the dictator, and could do nothing without his expreſs order. This ſubordination, however, was ſome time after removed; and during the ſecond Punic war the maſter of the horſe was inveſted with a power equal to that of the dictator. A ſecond dictator was alſo choſen for the election of magiſtrates at Rome after the battle of Cannæ. The dictatorſhip was originally confined to the patricians; but the plebeians were afterwards admitted to ſhare it. Titus Largius Flavus was the firſt dictator, in the year of Rome 253.

DICTION, the phraſe, elocution, or ſtyle, of a writer or ſpeaker. See ORATORY, n° 99—121.

DICTIONARY, in its original acceptation, is the arranging all the words of a language according to the order of the alphabet, and annexing a definition or explanation to each word. When arts and ſciences began to be improved and extended, the multiplicity of technical terms rendered it neceſſary to compile dictionaries, either of ſcience in general, or of particular ſciences, according to the views of the compiler.

*DICTIONARY of the Engliſh Language.* The deſign of every dictionary of language is to explain, in the moſt accurate manner, the meaning of every word; and to ſhow the various ways in which it can be combined with others, in as far as this tends to alter its meaning. The dictionary which does this in the moſt accurate manner, is the moſt complete. Therefore the principal ſtudy of a lexicographer ought to be, to diſcover a method which will be beſt adapted for that purpoſe. Dr Johnſon, with great labour, has collected the various meanings of every word, and quoted the authorities: but, would it not have been an improvement if he had given an accurate definition of the preciſe meaning of every word; pointed out the way in which it ought to be employed with the greateſt propriety; ſhowed the various deviations from that original meaning, which cuſtom had ſo far eſtabliſhed as to render allowable; and fixed the preciſe limits beyond which it could not be employed without becoming a vicious expreſſion? With this view, it would have been neceſſary to exhibit the nice diſtinctions that take place between words which are nearly ſynonymous. Without this, many words can only be defined in ſuch a manner, as that they muſt be conſidered as exactly ſynonymous. We omit giving any quotations from Johnſon, to point out theſe defects; and ſhall content ourſelves with giving a few examples, to ſhow how, according to our idea, a dictionary of the Engliſh language ought to be compiled.

IMMEDIATELY. *adv. of time.*

1. Inſtantly, without delay. Always employed to denote future time, and never paſt. Thus, we may ſay, *I will come immediately;* but not, *I am immediately come from ſuch a place.* See PRESENTLY.
2. Without the intervention of any cauſe or event; as oppoſed to *mediately.*

PRESENTLY. *adv. of time.*

1. Inſtantly, without delay. Exactly ſynonymous with *immediately;* being never with propriety employed to denote any thing but future time.
2. Formerly it was employed to expreſs preſent time. Thus, *The houſe preſently poſſeſſed by ſuch a one,* was often uſed: but this is now become a vicious expreſſion; and we ought to ſay, *The houſe poſſeſſed at preſent.* It differs from *immediately* in this, that even in the moſt corrupt phraſes it never can denote paſt time.

FORM. *ſubſt.* The external appearance of any object, when conſidered only with reſpect to ſhape or figure. This term therefore, in the literal ſenſe, can only be applied to the objects of the ſight and touch; and is nearly ſynonymous with *figure:* but they differ in ſome reſpects. *Form* may be employed to denote more rude and unfiniſhed ſhapes; *figure,* thoſe which are more perfect and regular. *Form* can never be employed without denoting matter; whereas *figure* may be employed in the abſtract: thus, we ſay a ſquare or a triangular *figure;* but not a ſquare or triangular *form.* And in the ſame manner we ſay, the *figure* of a houſe; but we muſt denote the ſubſtance which forms that figure, if we uſe the word *form;* as, *a cloud of the form of a houſe,* &c. See FIGURE.

2. In contraſt to irregularity or confuſion. As beauty cannot exiſt without order, it is by a figure of ſpeech employed to denote beauty, order, &c.
3. As *form* reſpects only the external appearance of bodies, without regard to their internal qualities, it is, by a figure of ſpeech, employed in contraſt to theſe qualities, to denote empty ſhow, without eſſential qualities. In this ſenſe it is often taken when applied to religious ceremonies, &c.
4. As *form* is employed to denote the external appearance of bodies; ſo, in a figurative ſenſe, it is applied to reaſoning, denoting the particular mode or manner in which this is conducted; as, *the form of a ſyllogiſm,* &c.
5. In the ſame manner it is employed to denote the particular mode of procedure eſtabliſhed in courts of law; as, *the forms of law, religion,* &c.
6. *Form* is ſometimes, although improperly, uſed to denote the different circumſtances of the ſame body; as, *water in a fluid or a ſolid form.* But as this phraſe regards the internal qualities rather than the external figure, it is improper; and ought to be, *water in a fluid or a ſolid ſtate.*
7. But when bodies of different kinds are compared with one another, this term may be employed to denote other circumſtances than ſhape or figure: for we may ſay, *a juice exſuding from a tree in the form of wax or reſin;* although, in this caſe, the conſiſtence, colour, &c. and not the external arrangement of parts, conſtitutes the reſemblance.
8. From the regular appearance of a number of perſons arranged in one long ſeat, ſuch perſons ſo arranged are ſometimes called a *form;* as, *a form of ſtudents,* &c. And,
9. By an eaſy tranſition, the ſeat itſelf has alſo acquired that name.

GREAT. *adj.* A relative word, denoting largeneſs of quantity, number, &c. ſerving to augment the value of thoſe terms with which it is combined, and oppoſed to *ſmall* or *little.* The principal circumſtances in which this word can be employed are the following:

1. When merely *in*animate objects are conſidered with regard to quantity, *great* is with propriety employed, to denote that the quantity is conſiderable; as, *a great mountain, a great houſe,* &c. and it is here contraſted with *ſmall.* When *great* is thus employed, we have no other word that is exactly ſynonymous.
2. When *in*animate objects are conſidered with regard to their extent, this term is ſometimes employed, although with leſs propriety; as, *a great plain, a great field,* &c. And in this ſenſe it is nearly ſynonymous with *large;* and they are often uſed indiſcriminately, but with ſome difference of meaning: for, as *large* is a term chiefly employed to denote extent of ſuperficies, and as *great* more particularly regards the quantity of matter; therefore, when *large* is applied to any object which is not merely ſuperficial, it denotes that it is the extent of ſurface that is there meant to be conſidered, without regard to the other dimenſions: whereas when the term *great* is employed, it has a reference to the whole contents. If, therefore, we ſay, *a large houſe,* or *a large river,* we expreſs that the houſe, the river, have a ſurface of great extent, without having any neceſſary connection with the ſize in other reſpects. But if we ſay, *a great houſe,* or *a great river,* it at once denotes that they have not only a large ſurface, but are alſo of great ſize in every reſpect.
3. *Great,* when applied to the human ſpecies, never denotes the ſize or largeneſs of body, but is applied ſolely to the qualities of the mind. Thus, when

when we ſay, that *Socrates was a great man*, we do not mean that he was a man of great ſize, but that he was a man who excelled in the endowments of the mind. The terms which denote largeneſs of ſize in the human body are, *big*, *bulky*, *huge*, &c.

4. *Great* is ſometimes applied to the human ſpecies, as denoting high rank. In this caſe it is oftener uſed in the plural number than otherwiſe. Thus we ſay ſimply, *the great*, meaning the whole body of men in high ſtation, as oppoſed to *mean*. It ſhould ſeldom be employed in this ſenſe, as it tends to confound dignity of rank with elevation of mind.

5. As this is a general term of augmentation, it may be joined with all nouns which denote *quantity*, *quality*, *number*, *excellence*, or *defects*; or ſuch as imply *praiſe*, *blame*, *anger*, *contempt*, or any other affection of the mind.

6. It is employed to denote every ſtep of aſcending or deſcending conſanguinity; as, *great-grandfather*, *great-grandſon*, &c.

HIGH. *adj.* Exalted in a perpendicular direction at a diſtance from the ſurface of the earth. Oppoſed to *low*.

1. *High* is a term altogether indefinite, and is employed to expreſs the degree of elevation of any inanimate body. Thus we ſay, *a high mountain*, *a high houſe*, *ſteeple*, *tower*, *pillar*, &c. Nor is there any other word that can here be conſidered as ſynonymous; *lofty* being employed only to denote a very eminent degree of elevation.

2. To expreſs the perpendicular elevation of vegetables, either *high* or *tall* may be employed, as being in this caſe nearly ſynonymous. We may therefore ſay, a *high* or *tall tree*, a *high* or *tall maſt*, &c. but with this difference between theſe two expreſſions, that *tall* can be more properly applied to thoſe that are much elevated and of ſmall dimenſions; and *high*, to ſuch as are more bulky, and of greater ſize.

3. The perpendicular height of man can never be expreſſed by the word *high*; *tall* being here the proper expreſſion. And altho' *high* is ſometimes uſed to expreſs the height of other animals, yet it ſeems to be an improper expreſſion. See Tall.

4. *High*, when applied to the human ſpecies, always refers to the mind; and denotes *haughtineſs*, *ſtatelineſs*, *pride*, &c. and, when combined with the expreſſions of any energy of the mind, it denotes that in a higher degree. In this ſenſe, it is oppoſed to *meanneſs*, *abjectneſs*, and *humility*.

5. As this is an indefinite term, tending to denote any thing that is elevated above us, it may be combined with almoſt every noun which admits of this elevation. And as objects high above us are always out of our reach, it is in a metaphorical ſenſe uſed to denote any thing that ſeems to be above the ordinary condition of mankind; or thoſe qualities or endowments of mind that are not eaſily acquired: as, *dignity* or *elevation of ſentiment*; *dignity of rank*; *acuteneſs in reaſoning on difficult ſubjects*; *pride*, *haughtineſs*, or any other quality which ſeems beyond the ordinary level of mankind; *dearneſs of price*, &c.

6. In the ſame manner we apply this term to time; which having a metaphorical reſemblance to a river flowing on with an unceaſing current through all ſucceſſive ages, any thing of remote antiquity is denoted by the term *high*.

7. Likewiſe thoſe degrees of latitudes far removed from the line, where the pole becomes more elevated.

8. And to ſome particular crimes, as being attended with peculiar degrees of guilt; as, *high treaſon*.

TALL. *adj.* Something elevated to a conſiderable degree in a perpendicular direction. Oppoſed to *low*.

1. This term is chiefly employed to expreſs the height of man and other animals; and is applied to denote the height of the body only, without having any reference to the mind. When applied to man, no other word can be ſubſtituted in its ſtead: when applied to other animals, *high* is ſometimes conſidered as nearly ſynonymous. See High.

2. It is likewiſe employed to denote the perpendicular height of vegetables; and in this caſe, it is nearly ſynonymous with *high*. See High.

3. It can in no caſe be employed to expreſs the height of merely inanimate objects; as we can never ſay a *tall ſteeple*, *tower*, or *pillar*, but a *high ſteeple*, &c. For the diſtinctions in theſe caſes, ſee High.

LONG. *adj.* A relative term, denoting the diſtance between the extremes of any body, which is extended more in one of its geometrical dimenſions than another. Oppoſed to *ſhort*.

1. This term may be applied to all inanimate objects, of watever kind, whoſe dimenſions in one way exceeds the other, and when not in an erect poſture, whatever be the other circumſtances attending them; whether it relates to ſuperficies alone, or to ſolid bodies; whether theſe be bounded or open, ſtraight or crooked, flexible or rigid, or in any other circumſtances whatever: thus we ſay, *a long* or *ſhort line*, *a long* or *ſhort ridge*, *ſtreet*, *ditch*, *rope*, *chain*, *ſtaff*, &c. But it is to be obſerved, that although *long* is in the ſtrict ſenſe only oppoſed to *ſhort*; yet as it expreſſes the extenſion of matter in one of its geometrical proportions, it is often contraſted by thoſe words which expreſs the other proportions when we mean only to deſcribe the ſeveral proportions: as, *a table long and broad*. And as theſe ſeveral dimenſions are expreſſed by different words, according to the various forms, modifications, and circumſtances, in which bodies are found, therefore it is in this ſenſe contraſted by a great diverſity of terms: as, *a long and broad* or *wide*, *narrow* or *ſtrait*, *ſtreet* or *lane*; *a long and thick*, or *ſmall*, *rope*, *chain*, *ſtaff*. For the diſtinctions in theſe caſes, ſee Broad, Wide, &c.

2. Objects neceſſarily fixed in an erect poſition can never have this term applied to them; and therefore we cannot ſay *a long*, but *a high*, *tower* or *ſteeple*. And for the ſame reaſon, while trees are growing and fixed in an erect poſition, we cannot apply this term to them; but when they are fell-

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ed and laid upon the ground, it is quite proper and neceſſary. Thus, we do not ſay *a long*, but *a tall* or *high tree*, while it is growing; but we ſay *a long*, not *a tall log of wood*: and in the ſame manner we ſay *a tall maſt*, when it is fixed in the ſhip; but *a long maſt*, while it lies upon the beach. See TALL and HIGH.

3. Thoſe vegetables which are of a tender pliant nature, or ſo weak as not to be able to retain a fixt poſition, being conſidered as of a middle nature between erect and proſtrate bodies, admit of either of the terms *long*, *tall*, or *high*; as, *a long* or *tall ruſh* or *willow wand*, or *a long*, *tall*, or *high ſtalk of corn*. See HIGH and TALL.
4. The parts of vegetables, when conſidered as diſtinct from the whole, even when growing and erect, aſſume the term *long*: for we do not ſay *a tall*, but *a long*, *ſhoot of a tree*; and *a tree with a long ſtem*, in preference to *a tree with a high ſtem*.
5. For the ſame reaſon, a ſtaff, and pole, even when fixed in a perpendicular direction, aſſume the word *long*, in preference to *tall* or *high*.
6. With regard to animals, the general rule is applied, without any exceptions: *tall*, and not *long*, being employed to denote the height of the human body, when in an erect poſture; and *long*, and not *tall*, to denote its length when in an incumbent ſituation. *Long*, applied to all other animals which do not walk erect, always denotes their greateſt length in a horizontal poſition from head to tail.
7. In a figurative ſenſe, it denotes, with regard to time, any thing at a great diſtance from us.
8. As alſo, any thing that takes up much time before it is finiſhed; as, *a long diſcourſe*, *a protracted note in muſic*, &c.

BROAD, *adj.* The diſtance between the two neareſt ſides of any body, whoſe geometrical dimenſions are larger in one direction than in another; and has a reference to ſuperficies only, and never to the ſolid contents. Oppoſed to *narrow*.

1. *Broad*, in the ſtricteſt acceptation, is applied to denote thoſe bodies only whoſe ſides are altogether open and unconfined; as, *a broad table*, *a broad wheel*, &c.: and in theſe caſes it is invariably contraſted by the word *narrow*; nor is there any other word which in theſe caſes can be conſidered as ſynonymous with it, or uſed in its ſtead.
2. When any object is in ſome ſort bounded on the ſides, although not quite cloſed up, as a road, ſtreet, ditch, &c. either *broad* or *wide* may be employed, but with ſome difference of ſignification; *broad* being moſt properly uſed for thoſe that are more open, and *wide* for thoſe which are more confined: nor can this term be ever applied to ſuch objects as are cloſe bounded all around, as a houſe, a church, &c. *wide* being here employed. For the more accurate diſtinctions in theſe caſes, ſee the article WINE.

WIDE. *adj.* A term employed to denote relative extent in certain circumſtances. Oppoſed to *narrow* and *ſtrait*.

1. This term is in its proper ſenſe applied only to denote the ſpace contained within any body cloſed all round on every ſide; as a houſe, gate, &c,: and differs from *broad* in this, that it never relates to the ſuperficies of ſolid objects, but is employed to expreſs the capaciouſneſs of any body which containeth vacant ſpace; nor can capaciouſneſs in this ſenſe be expreſſed by any other word but *wide*.
2. As many bodies may be conſidered either with reſpect to their capaciouſneſs or ſuperficial extent; in all theſe caſes, either the term *broad* or *wide* may be uſed; as, *a broad* or *wide ſtreet* or *ditch*, &c. but with a greater or leſs degree of propriety, according to the circumſtances of the object, or the idea we wiſh to convey. In a ſtreet where the houſes are low and the boundaries open, or in a ditch of ſmall depth and large ſuperficies, as this largeneſs of ſuperficies bears the principal proportion, *broad* would be more proper: but if the houſes are of great height, or the ditch of great depth, and capaciouſneſs is the principal property that affects the mind, we would naturally ſay *a wide ſtreet* or *ditch*; and the ſame may be ſaid of all ſimilar caſes. But there are ſome caſes in which both theſe terms are applied, with a greater difference of meaning; thus we ſay *a broad* or *a wide gate*: But as the gate is employed to denote either the aperture in the wall, or the matter which cloſes that aperture, theſe terms are each of them uſed to denote that particular quality to which they are generally applied: and as the opening itſelf can never be conſidered as a ſuperficies, the term *wide*, in this caſe, denotes the diſtance between the ſides of the aperture; while, on the contrary, *broad* denotes the extent of matter fitted to cloſe that aperture; nor can theſe two terms in any caſe be ſubſtituted for one another.
3. As a figurative expreſſion, it is uſed as a cant phraſe for a miſtake: as, *you are wide of the mark*; that is, not near the truth.

NARROW. *adj.* A relative term, denoting a proportional ſmallneſs of diſtance between the ſides of the ſuperficies of plain bodies. Oppoſed to *broad*.

1. As this is only applied to ſuperficies, it is exactly contraſted by *broad*, and is applied in all caſes where the term *broad* can be uſed, (ſee BROAD); and in no other caſe but as a contraſt to it, except the following.
2. It ſometimes is employed to deſcribe the ſmallneſs of ſpace circumſcribed between certain boundaries, as oppoſed to *wide*, and nearly ſynonymous with *ſtrait*; as we ſay *a wide* or *a narrow houſe*, *church*, &c. For the neceſſary diſtinctions here, ſee the article STRAIT.
3. In a figurative ſenſe it denotes *parſimony*, *poverty*, *confined ſentiments*, &c.

STRAIT, *adj.* A relative term, denoting the extent of ſpace in certain circumſtances. Oppoſed to *wide*; ſee WIDE.

1. This term is employed, in its proper ſenſe, to denote only ſpace, as contained between ſurrounding bodies in ſuch circumſtances as to denote ſome degree of confinement; and is exactly oppoſed to *wide*: as, *a wide* or *a ſtrait gate*, &c. See WINE.
2. So neceſſary is it that the idea of confinement ſhould

ſhould be connected with this word, that in all thoſe caſes where the ſpace contained is large, as in a church or houſe, we cannot expreſs a ſmaller proportional width by this term. And as we have no other word to expreſs ſpace in theſe circumſtances, we have been obliged to force the word *narrow* from its natural ſignification, and make it expreſs this. See Narrow.

3. In ſome particular caſes, *narrow* or *ſtrait* may be employed to the ſame object: as, *a narrow* or *a ſtrait line*: but here *ſtrait* is never employed but where an idea of confinement is ſuggeſted, and where it is exactly contraſted to *wide*; nor can *narrow* be employed but in ſuch circumſtances where *broad* would be a perfect contraſt to it. Therefore theſe two terms may be always employed in the ſame circumſtances as thoſe which contraſt them may be. For an account of which, ſee Wide.
3. The term *ſtrait* is likewiſe in a peculiar manner uſed to denote the ſmallneſs of the internal diameter of thoſe ſmall bodies which are fitted to receive or contain others, as any kind of bag, tube, body-clothes, mortoiſes, and others of the ſame kind; and in all theſe caſes this term may be employed to denote the ſmallneſs of their leſſer diameter, and never the term *narrow*. But in certain circumſtances the word *tight* may be ſubſtituted for it. See Tight.
4. *Strait*, in a figurative ſenſe, denotes any ſort of confinement of ſentiment or diſpoſition.

TIGHT. *adj.* A term employed in certain circumſtances to denote the internal capacity of particular bodies. Nearly ſynonymous with *ſtrait*.

This term is confined entirely to denote the ſmallneſs of the internal dimenſions of ſuch objects as are formed to cover or to receive or contain other ſolid bodies, and can be employed in no other caſe. And although it agrees with *ſtrait*, in always denoting confinement, and by being applicable to the ſame ſpecies of objects, yet it differs in the following reſpects: 1. If there be any difference of the diameter of the objects to which the term *ſtrait* can be applied, it always has reference to the ſmaller; yet *tight* may be applied to any ſort of confinement, whether it regards the length or breadth. 2. *Strait* can be applied to all bodies of capacity when of ſmall diameter, without any ſort of reference to the nature of the ſubſtance which it may be capable of containing. For we can ſay *a ſtrait bag, a ſtrait ſleeve, a ſtrait mortoiſe, a ſtrait gate*, &c. whereas *tight* can only be applied to any body when it is conſidered as having reference to another body which is intended to be contained in it, and is pinched for want of room. Thus we ſay, *the ſleeve of a coat is too tight for the arm, the mortoiſe is too tight for the tenon*, &c.; but we cannot ſay, *the bag, or the gate, is too tight*, becauſe theſe are fitted to receive any ſort of objects. And hence it happens, that, in many caſes, the dimenſions of the ſame body may be expreſſed by *tight* or *ſtrait* when conſidered in different circumſtances. Thus we may ſay, *this ſleeve is too ſtrait*, when we look at a coat when lying on the table, and conſider its proportions; but it is not till we have tried it upon the arm that it is intended to cover, that we call it *tight*. And we may ſay, *a gate is too ſtrait*, or *too tight*: but in the firſt caſe we conſider it as being too confined for admitting objects to paſs through it; and in the laſt, as being too confined with reſpect to the leaves that are to ſhut the aperture, not allowing them ſpace to move with freedom.

Theſe examples may ſerve to give ſome idea of the plan of an Engliſh Dictionary compoſed upon philoſophical principles: But, beſides the circumſtances above enumerated, there are many others which would require particular attention in the execution of a work of this kind. In the Engliſh language, a great variety of terms occur, which denote matter under certain general forms or circumſtances, without regarding the minute diverſities that may take place; as the word *cloth*, which denotes matter as manufactured into a particular form, including under it all the variety of ſtuffs manufactured in that particular way, of whatever materials, colours, texture, or fineneſs, they may be. The ſame may be ſaid of *wood*, *iron*, *yarn*, and a great variety of terms of the ſame nature, ſome of which cannot aſſume any plural; while others admit of it in all caſes, and others admit or refuſe it according to the different circumſtances in which they are conſidered. In a dictionary, therefore, all this variety of caſes ought to be clearly and diſtinctly pointed out under each particular article: this is the more neceſſary, as ſome of theſe words have others formed from them, which might be readily miſtaken for their plurals, altho' they have a very different ſignification; as *cloaths*, which does not denote any number of pieces or different kinds of *cloth*, but *wearing apparel*. The following example will illuſtrate this head.

WOOD. *ſub.* A ſolid ſubſtance, of which the trunks and branches of trees conſiſt.

1. This term is employed to denote the ſolid parts of vegetables of all kinds, in whatever form or circumſtances they are found. Nor does this term admit of plural with propriety, unleſs in the circumſtances after-mentioned: for we ſay, *many different kinds of wood*, in preference to *many kinds of woods*; or, we ſay, *oak*, *aſh*, or *elm wood*, not *woods*.
2. But where we want to contraſt *wood* of one quality or country with that of another, it admits of a plural: for we ſay, *white woods are in general ſofter than red*; or *Weſt-Indian woods are in general of greater ſpecific gravity than the European woods*: But unleſs where the colour, or ſome quality which diſtinguiſhes it from growing wood, is mentioned, this plural ought as much as poſſible to be avoided, as it always ſuggeſts an idea of growing wood.
3. *Wood* likewiſe denotes a number of trees growing near one another; being nearly ſynonymous with *foreſt*: See Forest. In this ſenſe it always admits of a plural; as, *Ye woods and wilds whoſe ſolitary gloom*, &c.

A dictionary cannot be reckoned complete without explaining obſolete words; and if the terms of the ſeveral provincial dialects were likewiſe given, it would be of great utility: nor would this take much time; becauſe a number of theſe words needs no other explanation than to mark along with them the words which had come in their place, when there happened to be one perfectly ſynonymous: and in thoſe caſes where the ſame idea could not be expreſſed in modern language without a periphraſis, it would be of uſe to explain them diſtinctly; ſo that, when a writer found himſelf at a loſs for a term, and obliged to ſearch for one beyond the bounds of our own language, he might take one of theſe, when he found that it was expreſſive and energetic, in preference to another drawn from a foreign language. This would at leaſt have one good effect: it would make our language more fixed and ſtable; not to ſay more accurate and preciſe, than by borrowing from foreign languages. The following examples may ſerve to give ſome idea of the manner of treating this part of the work.

*MOE*, or MO. *adj.* An obſolete term ſtill employed in the Scotch dialect, and by them pronounced *mae;* denoting a greater number, and nearly ſynonymous with *more:* but it differs in this reſpect, that in the Scotch dialect, *mae* and *mair* (Engliſh *more*) are each employed in their diſtinct ſphere, without encroaching upon one another; *mae* being employed to denote number, but never quantity or quality; and *mair*, to denote quantity and quality, but never number: thus they ſay *mae*, not *mair*, *apples*, *men*, &c, and they ſay *mair*, not *mae*, *cloth*, *earth*, *courage*, &c. See MAIR. Both of theſe terms are ſupplied by the word *more;* which in the Engliſh language is applied indiſcriminately to denote quantity, quality, and number. See MORE.

*THIR. pron.* Obſolete; ſtill employed in the Scotch dialect: the plural of *this;* and contraſted to *theſe*, in the ſame manner as *that* is to *this*.

As there is no word in the Engliſh language equivalent to this, we thus ſhow the manner in which it is employed. In the Engliſh language we ſay, *that ſtone* or *houſe*, pointing at one at a diſtance, *is larger or more commodious than this ſtone* or *this houſe*, which is ſuppoſed to be at hand. In the ſame manner, in the Scotch dialect, they ſay, *theſe* (or, as it is pronounced, *thae*) *ſtones are whiter than thir ſtones;* denoting, that the former are at a diſtance, and the latter at hand. And, in the ſame manner, it is invariably applied to denote any preſent object in the plural number, as oppoſed to *theſe:* as *theſe* or *thir apples*, as at hand, or at a diſtance; *theſe*, or *thir trees*, &c; but never in the ſingular number, as it is always *this* or *that tree*, *houſe*, &c.

As the Engliſh language is ſo exceedingly irregular in the pronunciation, the ſame letter in the ſame ſituation often aſſuming ſounds totally different in different words, it is impoſſible to eſtabliſh any general rules on this ſubject, which do not admit of many exceptions: therefore, a dictionary is the beſt means of aſcertaining and pointing out the proper pronunciation of words. For, if the writer firſt pointed out all the different ſounds that the ſame letter could ever be made to expreſs, and aſſigned to every particular ſound which each letter could be made to aſſume, a particular mark, which was appropriated to denote that particular ſound of the letter whenever it occurred; by placing theſe particular marks above the letters in the dictionary, the ſound of each letter would be pointed out in all caſes with the utmoſt certainty. It would be impoſſible for us to illuſtrate this by examples, without firſt aſcertaining all the ſounds of each letter; which would lead us into a diſcuſſion too long for this place.

We ſhall only further obſerve, that, beſides having the accented ſyllable of every word *properly* diſtinguiſhed in a dictionary to aſſiſt in the pronunciation, the Engliſh language requires another eſſential improvement, *viz.* the uſe of accents to diſtinguiſh the meaning of *words* and *phraſes:* which, although it is not ſo properly confined to a lexicographer, yet it is not quite without his ſphere. Thus the word *as* admits of two very different ſounds, as well as different ſignifications; as in this example, "Cicero was nearly *as* eloquent *as* Demoſthenes:" in which the firſt *as* is pronounced *aſs*, and the laſt is pronounced *az*. Now, it often happens, that, in reading, the particular way in which it ought to be underſtood is not pointed out by the context, till after the word itſelf is pronounced, which has an equal chance at leaſt of being pronounced wrong; whereas, if it were always accented when employed in the one ſenſe, and not in the other, it would free the reader from this perplexity. There are other caſes in which the uſe of proper accents in writing would be of great conſequence; as at the beginning of a ſentence, when it was put as a queſtion, or uſed ironically, &c. the want of which every one muſt have obſerved. But as this does not ſo properly belong to the lexicographer as the grammarian, we ſhall here take no further notice of it.

The above examples, we hope, will be ſufficient to give the reader ſome idea of the plan that we would propoſe; and enable him to determine, whether or not a dictionary, executed upon this plan, would convey to his mind a more perfect knowledge of the Engliſh language, than thoſe dictionaries that have been hitherto publiſhed. Theſe examples were given rather with a view to ſhow the manner in which a work of this kind might be conducted, than as perfect and unexceptionable explanations of the ſeveral articles there enumerated; and therefore we did not think it neceſſary to produce any authorities, although we are ſenſible that they would be requiſite in ſuch a work.

DICTYMNIA, or DICTYNNIA, in mythology, were feaſts celebrated at Lacedæmon and in Crete, in honour of Diana Dictymnia or Dictynnia, or of a nymph taken for her, who, having plunged herſelf into the ſea, to eſcape the paſſion of Minos, was caught in a fiſherman's net or δικτυον, whence the name.

DICTYS (Cretenſis), a very ancient hiſtorian, who ſerving under Idomeneus king of Crete in the Trojan war, wrote the hiſtory of that expedition in nine books; and Tzetzes tells us, that Homer formed his Iliad upon the plan of that hiſtory. It is however maintained, that the Latin hiſtory of Dictys which we have at preſent is ſpurious.

DIDACTIC, in the ſchools, ſignifies the manner of ſpeaking or writing, adapted to teach or explain the

the nature of things.—The word is formed from the Greek διδασκω, *doceo*, "I teach."

There are many words that are only uſed in the didactic and dogmatic way: and there are many works, ancient and modern, both in proſe and verſe, written after this method: ſuch are the Georgics of Virgil, Lucretius's poem De Rerum Natura, and Pope's Eſſays on Criticiſm and on Man, &c. &c.

DIDAPPER, in ornithology. See Colymbus.

Plate CLV. (in Vol. V.)

DIDELPHIS, or opossum, in zoology; a genus of quadrupeds belonging to the order of feræ, the characters of which are theſe: They have ten fore-teeth in the upper jaw, and eight in the under one. The dog-teeth are long; the tongue is ſomewhat ciliated; and they have a pocket formed by a duplicature of the ſkin of the belly, in which the dugs are included.

1. The marſupialis, or Virginian opoſſum, has a long ſharp-pointed noſe; large, round, naked, and very thin ears; ſmall, black, lively, eyes; long ſtiff hairs on each ſide the noſe, and behind the eyes: the hind part of the neck and back covered with hair two inches long; the bottoms of a yellowiſh white, middle part black, ends whitiſh: the ſides covered with hair of a dirty and duſky colour; the belly with ſoft, woolly, dirty white hair: the tail, for near three inches, clothed with long hairs like thoſe on the back; the reſt of the tail covered with ſmall ſcales. The tail of this animal has a diſagreeable appearance, looking like the body of a ſnake, and has the ſame prehenſile quality with that of ſome monkeys; the body is round and pretty thick, the legs ſhort: on the lower part of the belly of the female is a large pouch, in which the teats are lodged, and where the young ſhelter as ſoon as they are born. The length of the body is 16 or 17 inches; that of the tail 14.—This creature inhabits many parts of America and the Eaſt Indies. It is very deſtructive to poultry, and ſucks the blood without eating the fleſh; it feeds alſo on roots and wild fruits, and is very active in climbing trees. It hunts eagerly after birds and their neſts; and will hang ſuſpended from the branches of a tree by its tail; then, by ſwinging its body, it will fling itſelf among the trees that grow in the neighbourhood. It walks very ſlow; and when purſued and overtaken will feign itſelf dead. It is not eaſily killed, being as tenacious of life as a cat. When the female is about to bring forth, ſhe makes a thick neſt of dry graſs in ſome cloſe buſh at the foot of a tree; and brings four, five, or ſix, young at a time. As ſoon as the young are brought forth, they take ſhelter in the pouch or falſe belly; and faſten ſo cloſely to the teats, that they cannot be ſeparated without difficulty. They are blind, naked, and very ſmall, when new-born, and reſemble fetuſes: it is therefore neceſſary that they ſhould continue in that falſe belly till they attain proper ſtrength and ſight; and are prepared to undergo what may be called a *ſecond birth*. After this they run into the pouch as into an aſylum in time of danger; and the parent carries them about with her. During the time of this ſecond geſtation, the female ſhows an exceſſive attachment to her young, and will ſuffer any torture rather than allow this receptacle to be opened; for ſhe has the power of opening or cloſing it by the aſſiſtance of ſome very ſtrong muſcles. The fleſh of the old animal is very good, like that of a ſucking pig: the hair is dyed by the Indian women, and wove into garters and girdles: the ſkin is very fetid.

2. The Molucca opoſſum has long, oval, and naked ears: the mouth is very wide: the lower ſide of the upper jaw, throat, and belly, is of a whitiſh aſh colour; reſt of the hair a cinereous brown tipt with tawny, darkeſt on the back: the tail is as long as the body; near the baſe covered with hair, the reſt naked: the claws are hooked. On the belly of the female is a pouch, in which the young (like thoſe of the former) ſhelter. Marcgrave found ſix young within the pouch. It has ten cutting teeth above and eight below. The length of the animal from noſe to tail is ten inches; and the tail exceeds the length of head and body. Its whole figure is of a much more ſlender and elegant make than the former. The tail pulveriſed, and taken in a glaſs of water, is reckoned in New Spain a ſovereign remedy againſt the gravel, colic, and ſeveral other diſorders. This ſpecies is found in great numbers in Aroe and Solor: It is called in the Indies *pelandor aroe*, or the *aroe rabbet*. They are reckoned very delicate eating; and are very common at the tables of the great, who rear the young in the ſame places in which they keep their rabbets. It inhabits alſo Surinam, and the hot parts of America.

3. The murina, or murine opoſſum, hath the face and upper parts of the body of a tawny colour; the belly of a yellowiſh white: the tail is ſlender, and covered with minute ſcales to the very rump: the length of the animal from noſe to tail, about ſix inches and a half; the tail of the ſame length: the female wants the falſe belly of the former; but on the lower part the ſkin forms on each ſide a fold, between which the teats are lodged. It inhabits the hot parts of South America; agrees with the others in its food, manners, and the prehenſile power of its tail. It brings from 10 to 14 young ones at a time: they affix themſelves to the teats as ſoon as they are born, and remain attached like inanimate things, till they attain growth and vigour to ſhift a little for themſelves.

4. The Mexican opoſſum, is of an aſh-colour on the head and upper parts of the body: the belly and legs are whitiſh: the tail is long and pretty thick, varied with brown and yellow; it is hairy near an inch from its origin, the reſt naked: the length of the animal from noſe to tail, about ſeven inches and a half; of the tail, more than 11.—It inhabits the mountains of Mexico, and lives in trees, where it brings forth its young: when in any fright, they embrace the parent cloſely. The tail is prehenſile, and ſerves inſtead of a hand.

5. The phalanger, or Surinam opoſſum of Buffon, has the upper part of the body reddiſh, mixed with a light aſh-colour and yellow: the under parts are of a dirty yellowiſh white; the bottom of the tail is covered with hair, for near two inches and a half; the reſt naked: the length of the animal from noſe to tail is near nine inches; the tail ten. It inhabits Surinam, according to Buffon; who ſuppoſes it may be the ſpecies called by the coloniſts the *cane rat*, which is ſo deſtructive to the ſugar-canes. According to Dr Pallas, it inhabits the Eaſt India iſlands, but is not found in Surinam.

6. The dorſigera, or merian opoſſum, hath the head and upper part of the body of a yellowiſh brown colour; the belly white, and tinged with yellow; the

tail very long and ſlender, and, except at the baſe, quite naked.—It is a native of Surinam, and burrows under ground: it brings five or ſix young at a time, which follow their parent: on any apprehenſion of danger, they all jump on her back; and twiſting their tails round her's, ſhe immediately runs with them into her hole.

7. The kanguroo. This animal has a ſmall head, neck, and ſhoulders; the body increaſing in thickneſs to the rump. The head is oblong, formed like that of a fan, and tapering from the eyes to the noſe; end of the noſe naked and black; the upper lip divided. The noſtrils are wide and open; the lower jaw is ſhorter than the upper; and the aperture of the mouth ſmall: there are whiſkers on both jaws, thoſe on the upper longeſt; and ſtrong hairs above and below the eyes. The eyes are not large; the irides are duſky; the pupil is of a bluiſh black. The ears are erect, oblongly ovated, rounded at the ends, and thin, covered with ſhort hairs; four inches long. There are no canine teeth; but ſix broad cutting teeth in the upper jaw; two long lanceolated teeth in the lower, pointing forward; and four grinding teeth in each jaw, remote from the others. The belly is convex and great. The fore legs are very ſhort, ſcarcely reaching to the noſe; and uſeleſs for walking. The hind legs are almoſt as long as the body; and the thighs are very thick: on the fore feet are five toes, with long conic and ſtrong claws; on the hind feet, only three: the middle toe is very long and thick, like that of an oſtrich; the two others are placed very diſtinct from it, and are ſmall: the claws are ſhort, thick, and blunt: the bottom of the feet, and hind part, black, naked, and tuberculated, as the animal reſts often on them. The tail is very long, extending as far as the ears; thick at the baſe, tapering to a point. The ſcrotum is large and pendulous. The hair on the whole animal is ſoft, and of an aſh-colour; lighteſt on the lower parts. The dimenſions of a full grown animal are not yet known. The following are thoſe of a male lately ſent to Lord Sidney by Governor Phillip.

| | f. | in. |
|---|---|---|
| Length from the point of the noſe to the end of the tail, - - - | 8 | 5 |
| Length of the tail, - - | 3 | 1 |
| ——— ——— head, - - | 0 | 11 |
| ——— ——— fore legs, - - | 2 | 0 |
| ——— ——— hind legs, - - | 3 | 7 |
| Circumference of the fore part by the legs, | 1 | 9 |
| ——— ——— ——— lower parts ——— | 4 | 5 |
| Round the thicker part of the tail, which gradually tapers to the end. - - | 1 | 1 |

The above is the largeſt kanguroo that has yet been ſeen, and we are told there is every reaſon to believe that even this had not nearly attained its full growth.

It inhabits the weſtern ſide of New Holland, and has as yet been diſcovered in no other part of the world. It lurks among the graſs; and feeds on vegetables: it goes entirely on its hind legs; making uſe of the fore feet only for digging, or bringing its food to its mouth. The dung is like that of a deer. It is very timid: at the ſight of men it flies from them by amazing leaps, ſpringing over buſhes ſeven or eight feet high; and going progreſſively from rock to rock. It carries its tail quite at right angles with its body when it is in motion; and when it alights, often looks back.

In the account lately publiſhed of Governor Phillip's Voyage, we are told that theſe animals have been ſeen feeding in herds of about 30 or 40; and that one is always obſerved to be apparently on the watch at a diſtance from the reſt.—The largeſt kanguroo which has yet been ſhot, we are there told, weighed about 140 pounds. But it has been diſcovered that there are two kinds, one of which ſeldom exceeds 60 pounds in weight: theſe live chiefly on the high grounds: their hair is of a reddiſh caſt, and the head is ſhorter than the larger ſort. Young kanguroos which have been taken, have in a few days grown very tame, but none have lived more than two or three weeks. Yet it is ſtill poſſible that when their proper food ſhall be better known, they may be domeſticated. Near ſome water was found the dung of an animal that fed on graſs, which, it was ſuppoſed, could not have been leſs than a horſe. A kanguroo, ſo much above the uſual ſize, would have been an extraordinary phænomenon, though no larger animal has yet been ſeen, and the limits of growth in that ſpecies are not aſcertained. The tail of the kanguroo, which is very large, is found to be uſed as a weapon of offence, and has given ſuch ſevere blows to dogs as to oblige them to deſiſt from purſuit. Its fleſh is coarſe and lean, nor would it probably be uſed for food, where there was not a ſcarcity of freſh proviſions.

Mr Pennant obſerves, that this is a very anomalous animal; but ranks it under this genus as having more relation to it than to any other. In the account of of Phillip's Voyage, however, we are informed, that the pouch of the female, hitherto eſteemed peculiar to the opoſſum genus, has been found both in the rat and the ſquirrel kind in New Holland.

8. The quoll, or ſpotted opoſſum, is deſcribed as in length from the noſe to the beginning of the tail about 15 inches, and the tail about nine or ten. The general colour black, inclining to brown beneath; the neck and body, ſpotted with irregular roundiſh patches of white; the ears pretty large and erect; the viſage pointed, the muzzle furniſhed with long ſlender hairs; the legs, from the knees downward, almoſt naked, and aſh-coloured; on the fore feet are five claws, and on the hind, four and a thumb without a claw; the tail, for about an inch and an half from the root, is covered with hairs of the ſame length as thoſe on the body, from thence to the end with long ones not unlike that of a ſquirrel. The female has ſix teats placed in a circle within the pouch.

9. The kanguroo rat is deſcribed as ſimilar, both in the general ſhape of the body and the conformation of the legs, to the kanguroo; but the viſage having a ſtrong reſemblance to that of the rat, and the colour of the whole not ill reſembling that animal, it has obtained the name of the *kanguroo rat*. It is an inhabitant of New Holland; and two of the ſpecies are now to be ſeen alive at the curious exhibition of animals over Exeter Exchange; where one of them, being a female, has brought forth young. This ſpecies has two cutting teeth in front of the upper jaw, with three others on each ſide of them; and at a diſtance

one falſe grinder, ſharp at the edge, and channelled or fluted on the ſides; and cloſe to theſe, two true grinders: in the lower jaw there are two long cutting teeth formed like thoſe of the ſquirrel, with three grinders correſponding with thoſe in the upper jaw.

10. The flying opoſſum, a beautiful ſpecies, and clothed with fur of the moſt exquiſite texture, is an inhabitant of New Wales. In length, from the tip of the noſe to the root of the tail, it is 20 inches; the tail itſelf is 22 inches, at the baſe quite light, increaſing gradually to black at the end: the ears are large and erect: the coat or fur is of a richer and moſt delicate texture; appearing, on the upper parts of the body, at firſt ſight, of a gloſſy black, but on a nicer inſpection found to be mixed with grey; the under parts are white, and on each hip is a tan-coloured ſpot nearly as big as a ſhilling; at this part the fur is thinneſt, but at the root of the tail it is ſo rich and cloſe that the hide cannot be felt through it. The fur is alſo continued to the claws. On each ſide of the body is a broad flap or membrane (as in the flying ſquirrels), which is united to both the fore and hind legs. The jaws are furniſhed with teeth, placed as in ſome others of this genus: in the upper jaw forwards are four ſmall cutting teeth, then two canine ones, and backwards five grinders: the under jaw has two long large cutting teeth, five grinders, with no intermediate canine ones, the ſpace being quite vacant. The fore legs have five toes on each foot, with a claw on each; the hinder ones four toes, with claws (the three outſide ones without any ſeparation), and a thumb without a claw, enabling the animal to uſe the foot as a hand, as many of the opoſſum tribe are obſerved to do.

11. The Cayenne opoſſum has a long ſlender face: ears erect, pointed, and ſhort: the coat woolly, mixed with very coarſe hairs, three inches long, of a dirty white from the roots to the middle; from thence to the ends of a deep brown; ſides and belly of a pale yellow; legs of a duſky brown; thumb on each foot diſtinct; on the toes of the fore feet, and thumb of the hind, are nails; on the toes of the hind feet crooked claws; tail very long, taper, naked, and ſcaly. Length 17 French inches; of the tail fifteen and a half. The ſubject meaſured was young. Inhabits Cayenne: very active in climbing trees, on which it lives the whole day. In marſhy places, feeds on crabs, which when it cannot draw out of their holes with its feet, it hooks them by means of its long tail. If the crab pinches its tail, the animal ſets up a loud cry, which may be heard afar: its common voice is a grunt like a young pig. It is well furniſhed with teeth, and will defend itſelf ſtoutly againſt dogs; brings forth four or five young, which it ſecures in ſome hollow tree. The natives eat theſe animals, and ſay their fleſh reſembles a hare. They are eaſily tamed, and will then refuſe no kind of food.

12. The New Holland opoſſum has the upper part of the head, and the back and ſides, covered with long, ſoft, gloſſy hairs, of a dark cinereous colour at the bottoms, and of a ruſty brown towards the ends: the belly is of a dirty white. The tail is taper, covered with ſhort brown hairs, except for four inches and a half of the end, which is white, and naked underneath; the toes like thoſe of the former. Deſcribed by Mr Pennant from a ſkin, the length of which, from the head to the tail, was 13 inches, and the tail the ſame. The animal was found near Endeavour river, on the eaſtern coaſt of New Holland, with two young ones. It lodges in the graſs, but is not common. There are two or three other ſpecies.

DIDO, called alſo ELISA, a daughter of Belus king of Tyre, who married Sichæus or Sicharbas her uncle, who was prieſt of Hercules. Pygmalion, who ſucceeded to the throne of Tyre after Belus, murdered Sichæus to get poſſeſſion of the immenſe riches which he had; and Dido, diſconſolate for the loſs of her huſband, whom ſhe tenderly loved, and by whom ſhe was equally eſteemed, ſet ſail in queſt of a ſettlement with a number of Tyrians, to whom the cruelty of the tyrant became odious. According to ſome accounts, ſhe threw into the ſea the riches of her huſband which Pygmalion ſo greedily deſired, and by that artifice compelled the ſhips to fly with her that had come by order of the tyrant to obtain the riches of Sichæus. During her voyage, Dido viſited the coaſt of Cyprus; where ſhe carried away 50 women who proſtituted themſelves on the ſea-ſhore, and gave them as wives to her Tyrian followers. A ſtorm drove her fleet on the African coaſt, and ſhe bought of the inhabitants as much land as could be covered by a bull's hide cut into thongs. Upon this piece of land ſhe built a citadel called *Byrſa*; and the increaſe of population, and the riſing commerce among her ſubjects, ſoon obliged her to enlarge her city and the boundaries of her dominions. Her beauty, as well as the fame of her enterpriſe, gained her many admirers; and her ſubjects wiſhed to compel her to marry Iarbas king of Mauritania, who threatened them with a dreadful war. Dido begged three months to give her deciſive anſwer; and during that time ſhe erected a funeral pile, as if wiſhing by a ſolemn ſacrifice to appeaſe the manes of Sichæus, to which ſhe had promiſed eternal fidelity. When all was prepared, ſhe ſtabbed herſelf on the pile in preſence of her people; and by this uncommon action obtained the name of *Dido*, "valiant woman," inſtead of Eliſa. According to Virgil and Ovid, the death of Dido was cauſed by the ſudden departure of Æneas; of whom ſhe was deeply enamoured, and whom ſhe could not obtain as a huſband. This poetical fiction repreſents Æneas as living in the age of Dido, and introduces an anachroniſm of near 300 years. Dido left Phœnicia 247 years after the Trojan war or the age of Æneas, that is, about 953 years before Chriſt. This chronological error proceeds not from the ignorance of the poets, but it is ſupported by the authority of Horace:

*Aut famam ſequere, aut ſibi convenientia finge.*

While Virgil deſcribes, in a beautiful epiſode, the deſperate love of Dido, and the ſubmiſſion of Æneas to the will of the gods, he at the ſame time gives an explanation of the hatred which exiſted between the republics of Rome and Carthage; and informs his reader, that their mutual enmity originated in their very firſt foundation, and was apparently kindled by a more remote cauſe than the jealouſy and rivalſhip of two flouriſhing empires. Dido after her death was honoured as a deity by her ſubjects.

DIDUS, or DODO, in ornithology, a genus belonging to the order of gallinæ. The bill is contracted in the middle by two tranſverſe rugæ; each mandible is inflected at the point; and the face is bare behind the eyes. Only one ſpecies, the ineptus, is mentioned by Linnæus; but three are deſcribed by Buffon: though it is doubted whether on further obſervation they may not all prove one and the ſame ſpecies, differing only in ſex or age.

1. The dronte, or hooded dodo, (ineptus, *Lin.*), is ſomewhat bigger than a ſwan, and near three feet in length. The bill is ſtrong, large, and hooked at the end; the gape ſtretches beyond the eyes: the colour of it is a very pale blue; except the end of the upper mandible, which is yellowiſh, and a red ſpot on the bend of it; the end of the lower is blackiſh: the irides are white. The general colour of the plumage is cinereous, and ſoft to the touch; the belly and thighs are whitiſh. The head is large, and ſeems as it were covered with a black hood or cowl. The wings are very ſhort, and of a yellowiſh aſh-colour: the tail feathers are curled, ſtand up on the rump, and incline to yellow. The legs have four toes, three before and one behind; are very ſtout, ſhort, and yellowiſh: the claws are black. It inhabits the iſlands of Mauritius and Bourbon in the Indian Ocean.

2. The ſolitaire, or ſolitary dodo, is a large bird, and the male is ſaid to weigh ſometimes 45 pounds. The neck is of a proportionable length, and the eye black and lively: the head is not creſted, and the general colour of the plumage is grey and brown mixed: it has ſcarce any tail, and the baſtard wing ſwells out into a round knob: the wings are too ſhort for flight; and the hind parts are rounded like a horſe's rump, being clothed with feathers, which may be termed *coverts.* —The females are covered with ſometimes brown and ſometimes light yellow feathers, and appear very beautiful. The feathers on each ſide of the breaſt enlarge into two white tufts, ſomewhat reſembling the boſom of a woman. Thoſe of the thighs are rounded at the end like ſhells; and, according to Leguat, the bird has altogether a noble and elegant gait. This is an inhabitant of the Iſle of Rodrigue, where it is not uncommon; but not met with in flocks, ſcarcely more than two being found together. It makes the neſt in by-places, of leaves of the palm, a foot and a half in thickneſs; and lays one egg, bigger than that of a gooſe. The male ſits in his turn; and does not ſuffer any bird to approach within 200 yards of the ſpot while the hen is ſitting, which is ſeven weeks. The young is ſome months before it can ſhift for itſelf; the old ones, in the mean time, are affectionate to it, and faithful to each other afterwards, though they occaſionally may mix with others of their kind. The young birds, though timid, are ſtupid enough to ſuffer the approach of any one; but when grown up are more ſhy, and will not be tamed. They are chaſed in the winter ſeaſon, *viz.* from March to September; being then fat, and the young birds are much eſteemed for the table.

3 The Nazarene dodo is bigger than a ſwan. The bill is a little bent downwards and large: inſtead of feathers, the whole is covered over with a black down; but the wings are feathered, and it has ſome frizzled ones upon the rump, which ſerve inſtead of a tail: the legs are long and ſcaly, and there are three toes on each foot. This was met with in the Iſle of France, and deſcribed as above by Fr. Cauche; who adds, that the female only lays one egg, which is white, and as big as a penny loaf, and that there is always found with it a white ſtone of the ſize of an hen's egg; that it makes the neſt of leaves and dry herbs, in the foreſts, on the ground; and that there is likewiſe found a grey ſtone in the gizzard of the young bird.

DIDYMUS of Alexandria, an eccleſiaſtical writer of the fourth century; who, though he is ſaid to have loſt his eyes at five years of age, when he had ſcarcely learned to read, yet applied ſo earneſtly to ſtudy, that he attained all the philoſophic arts in a high degree, and was thought worthy to fill the chair in the famous divinity-ſchool at Alexandria. He was the author of a great number of works: but all we have now remaining are, a Latin tranſlation of his book upon the Holy Spirit, in the works of St Jerome, who was the tranſlator; ſhort ſtrictures on the Canonical Epiſtles; and a book againſt the Manichees.

DIDYNAMIA (from δις *twice*, and δυναμις *power*), the name of the 14th claſs in Linnæus's ſexual method; conſiſting of plants with hermaphrodite flowers, which have four ſtamina or male organs, two of which are long and two ſhort. See BOTANY, the Scheme, and Plate CII. fig. 14.

DIEMEN's LAND, the ſouthern coaſt or point of New Holland, S. Lat. 43° 21 20′, E Long. 147° 29′. This coaſt was diſcovered in November 1642 by Taſman, who gave it the name of *Van Diemen's Land*. Captain Furneaux touched at it in March 1773, and the country has been ſince further explored by our late navigators. Here is a very ſafe road, named by Captain Cook *Adventure Bay*. The parts adjoining to the bay are moſtly hilly, and form an entire foreſt of tall trees, rendered almoſt impaſſable by brakes of fern, ſhrubs, &c. The ſoil on the flat land, and on the lower part of the hills, is ſandy, or conſiſts of a yellowiſh earth, and in ſome parts of a reddiſh clay; but further up the hills it is of a grey tough caſt. This country, upon the whole, bears many marks of being very dry, and the heat appears to be great. No mineral bodies, nor ſtones of any other kind than the white ſand-ſtone, were obſerved: nor any vegetables that afforded ſubſiſtence for man. The foreſt-trees are all of one kind, generally quite ſtraight, and bearing cluſters of ſmall white flowers. The principal plants obſerved were wood-ſorrel, milk-wort, cudweed, bell-flower, gladiolus, ſamphire, and ſeveral kinds of fern. The only quadruped ſeen diſtinctly was a ſpecies of opoſſum, about twice the ſize of a large rat. The kanguroo, found farther northward in New Holland, may alſo be ſuppoſed to inhabit here, as ſome of the inhabitants had pieces of the ſkin of that animal. The principal ſorts of birds in the woods are brown hawks or eagles, crows, large pigeons, yellowiſh paroquets, and a ſpecies which was called *motacilla cyanea*, from the beautiful azure colour of its head and neck. On the ſhore were ſeveral gulls, black oyſter-catchers or ſea-pies, and plovers of a ſtone-colour. In the woods were ſeen ſome blackiſh ſnakes of a pretty large ſize; and a ſpecies of lizard fifteen inches long and ſix round, beautifully

fully clouded with yellow and black. Among a variety of fiſh caught, were ſome large rays, nurſes, leather-jackets, bream, ſoles, flounders, gurnards, and elephant-fiſh. Upon the rocks are muſcles and other ſhell-fiſh, and upon the beach were found ſome pretty Meduſa's heads. The moſt troubleſome inſects met with were the muſquitoes; and a large black ant, the bit of which inflicts extreme pain.

The inhabitants ſeemed mild and cheerful, with little of that wild appearance which ſavages in general have. They are almoſt totally devoid of perſonal activity or genius, and are nearly upon a par with the wretched natives of Terra del Feugo. They diſplay, however, ſome contrivance in their method of cutting their arms and bodies in lines of different directions, raiſed above the ſurface of the ſkin. Their indifference for preſents offered them, their general inattention and want of curioſity, were very remarkable, and teſtified no acuteneſs of underſtanding. Their complexion is a dull black, which they ſometimes heighten by ſmutting their bodies, as was ſuppoſed from their leaving a mark behind on any clean ſubſtance. Their hair is perfectly woolly, and is clotted with greaſe and red ochre like that of the Hottentots. Their noſes are broad and full, and the lower part of the face projects conſiderably. Their eyes are of a moderate ſize; and though they are not very quick or piercing, they give the countenance a frank, cheerful, and pleaſing caſt. Their teeth are not very white nor well ſet, and their mouths are wide: they wear their beards long and clotted with paint. They are upon the whole well proportioned, though their belly is rather protuberant. Their favourite attitude is to ſtand with one ſide forward, and one hand graſping acroſs the back the oppoſite arm, which on this occaſion hangs down by the ſide that projects.

. Near the ſhore in the bay were obſerved ſome wretched conſtructions of ſticks covered with bark; but theſe ſeemed to have been only temporary, and they had converted many of their largeſt trees into more comfortable and commodious habitations. The trunks of theſe were hollowed out to the height of ſix or ſeven feet by means of fire. That they ſometimes dwell in them was manifeſt from their hearths in the middle made of clay, round which four or five perſons might ſit. Theſe places of ſhelter are rendered durable by their leaving one ſide of the tree ſound, ſo that it continues growing with great luxuriance.

DIEMERBROEK (Iſbrand), a learned profeſſor of phyſic and anatomy at Utrecht, was born at Montfort, in Holland, in 1609, where he acquired great reputation by his lectures and his practice; and died at Utrecht in 1674. He wrote a treatiſe on the plague, which is eſteemed; and ſeveral learned works in anatomy and medicine, which were printed at Utrecht in 1685 in folio.

DIEPPE, a handſome ſea-port town of France, in Upper Normandy, in the territory of Caux; with a good harbour, an old caſtle, and two handſome moles. The pariſh-church of St James is an elegant ſtructure; and there is a tower from which, in fine weather, the coaſt of England may be ſeen. The principal trade conſiſts in herrings, whitings, mackerel, ivory, toys, and laces. It was bombarded by the Engliſh in 1694, and it is not now ſo conſiderable as it was formerly. It is ſeated at the mouth of the river Argues, in E. Long. 1. 9. N. Lat. 49 55.

DIES MARCHIÆ, was the day of congreſs or meeting of the Engliſh and Scots, annually appointed to be held on the marches or borders, in order to adjuſt all differences between them.

DIESIS, in muſic, is the diviſion of a tone leſs than a ſemitone; or an interval conſiſting of a leſs or imperfect ſemitone.

Dieſis is the ſmalleſt and ſofteſt change or inflexion of the voice imaginable: it is called a *faint*, expreſſed thus X, by a St Andrew's croſs or ſaltier.

DIESPITER, in antiquity, a name given to Jupiter; and ſignifying *diei pater*, "father of the day." St Auguſtin derives the name from *dies* "day," and *partus* "production, bringing forth;" it being Jupiter that brings forth the day. Of which ſentiment were Servius and Macrobius; the former adding, that in the language of the Oſci they called him *Lucentius*, as *Dieſpiter* in Latin.

DIET, in medicine, according to ſome, comprehends the whole regimen or rule of life with regard to the ſix non naturals; air, meats and drinks, ſleep and watching, motion and reſt, paſſions of the mind, retentions and excretions. Others reſtrain the term of *diet* to what regards eating and drinking, or ſolid aliments and drinks. See Food.

The natural conſtitution of the body of man is ſuch, that it can eaſily bear ſome changes and irregularities without much injury. Had it been otherwiſe, we ſhould be almoſt conſtantly put out of order by every ſlight cauſe. This advantage ariſes from thoſe wonderful communications of the inward parts, whereby, when one part is affected, another comes immediately to its relief.

Thus, when the body is too full, nature cauſes evacuations through ſome of the outlets: and for this reaſon it is, that diſeaſes from inanition are generally more dangerous than from repletion; becauſe we can more expeditiouſly diminiſh than increaſe the juices of the body. Upon the ſame account, alſo, though temperance be beneficial to all men, the ancient phyſicians adviſed perſons in good health, and their own maſters, to indulge a little now and then, by eating and drinking more plentifully than uſual. But, of the two, intemperance in drinking is ſafer than in eating: and if a perſon has committed exceſs in the latter, cold water drank upon a full ſtomach will help digeſtion; to which it will be of ſervice to add lemon juice, or elixir of vitriol. If he has eaten high ſeaſoned things, rich ſauces, &c. then let him ſit up for ſome little time, and afterwards ſleep. But if a man happen to be obliged to faſt, he ought to avoid all laborious work. From ſatiety it is not proper to paſs directly to ſharp hunger, nor from hunger to ſatiety: neither will it be ſafe to indulge abſolute reſt immediately after exceſſive labour, nor ſuddenly to fall to hard work after long idleneſs. In a word, therefore, all changes in the way of living ſhould be made by degrees.

The ſofter and milder kinds of aliment are proper for children, and for youth the ſtronger. Old people ought to leſſen the quantity of their food, and increaſe that of their drink: but yet ſome allowance is to be made for cuſtom, eſpecially in the colder climates like ours; for as in theſe the appetite is keener, ſo is the digeſtion better performed. *Mead's Monita & Præcepta.*

*Diet-Drinks*, a form in phyſic, including all the medicated wines, ales, and wheys, uſed in chronic caſes. They require a courſe or continuation to anſwer any intention of moment.

*Diet of Appearance*, in Scots law, the day to which a defender is cited to appear in court; and every other day to which the court ſhall afterwards adjourn the conſideration of the queſtion.

Diet, or *Dyet*, in matters of policy, is uſed for the general aſſembly of the ſtates or circles of the empire of Germany and of Poland, to deliberate and concert meaſures proper to be taken for the good of the public.

The general diet of the empire is uſually held at Ratiſbon. It conſiſts of the emperor, the nine electors, and the eccleſiaſtical princes; *viz.* the archbiſhops, biſhops, abbots, and abbeſſes; the ſecular princes, who are dukes, marquiſes, counts, viſcounts, or barons; and the repreſentatives of the imperial cities. It meets on the emperor's ſummons, and any of the princes may ſend their deputies thither in their ſtead. The diet makes laws, raiſes taxes, determines differences between the ſeveral princes and ſtates, and can relieve the ſubjects from the oppreſſions of their ſovereigns.

The diet of Poland, or the aſſembly of the ſtates, conſiſted of the ſenate and deputies, or repreſentative of every palatinate or county and city; and uſually met every two years, and oftener upon extraordinary occaſions, if ſummoned by the king, or, in his abſence, by the archbiſhop of Gneſna. The general diet of Poland ſat but ſix weeks, and often broke up in a tumult much ſooner: for one diſſenting voice prevented their paſſing any laws, or coming to any reſolutions on what was propoſed to them from the throne. Switzerland has alſo a general diet, which is uſually held every year at Baden, and repreſents the whole Helvetic body: it ſeldom laſts longer than a month. Beſides this general diet, there are diets of the Proteſtant cantons, and diets of the catholic ones: the firſt aſſemble at Araw, and are convoked by the canton of Zurich; the ſecond at Lucern, convoked by the canton of that name.

DIETETIC, denotes ſomething belonging to diet, but particularly that part of phyſic which treats of this ſubject. See Diet, Food, and Drink.

DIETRICH, or Dietricy (Chriſtian William Erneſt), a modern artiſt, who was born at Weimar in 1712. He reſided chiefly at Dreſden, where he was profeſſor of the academy of arts. He was a painter of very extenſive abilities, and ſucceeded both in hiſtory and landſcape. We have by him a great number of ſmall ſubjects, to the amount of 150 or more, which he engraved from his own compoſitions, in the ſtyle, ſays Baſan, of Oſtade of Laireſſe, and of Salvator Roſa. Sixty of theſe etchings are exceedingly rare.

DIETS, a town in the circle of the Upper Rhine in Germany, ſituated on the river Lohn, twenty miles north of Mentz, and ſubject to the houſe of Naſſau-Orange. E. Long. 7. 40. N. Lat. 50. 23.

DIEU et mon droit, i. e. *God and my right*, the motto of the royal arms of England, firſt aſſumed by king Richard I. to intimate that he did not hold his empire in vaſſalage of any mortal.

It was afterwards taken up by Edward III. and was continued without interruption to the time of the late king William, who uſed the motto *Je main tiendray*, though the former was ſtill retained upon the great ſeal. After him queen Anne uſed the motto *Semper eadem*, which had been before uſed by queen Elizabeth; but ever ſince queen Anne, *Dieu et mon droit* continues to be the royal motto.

DIFF, is the name of an inſtrument of muſic among the Arabs, ſerving chiefly to beat time to the voice: it is a hoop, ſometimes with pieces of braſs fixed to it to make a jingling, over which a piece of parchment is diſtended. It is beat with the fingers, and is the true *tympanum* of the ancients.

DIFFARREATION, among the Romans, a ceremony whereby the divorce of their prieſts was ſolemnized. The word comes from the prepoſition *dis*; which is uſed, in compoſition, for *diviſion* or *ſeparation*; and *farreatio*, a ceremony with wheat, of *far* "wheat."

Diffarreation was properly the diſſolving of marriages contracted by confarreation; which were thoſe of the pontifices or prieſts. Feſtus ſays, it was performed with a wheaten cake. Vigenere will have confarreation and diffarreation to be the ſame thing.

DIFFERENCE, in mathematics, is the remainder, when one number or quantity is ſubtracted from another.

Difference, in logic, an eſſential attribute belonging to ſome ſpecies, and not found in the genus; being the idea that defines the ſpecies. Thus, body and ſpirit are the two ſpecies of ſubſtance, which in their ideas include ſomething more than is included in the idea of ſubſtance. In body, for inſtance, is found impenetrability and extenſion; in ſpirit, a power of thinking and reaſoning: ſo that the difference of body is impenetrable extenſion, and the difference of ſpirit is cogitation.

Difference, in heraldry, a term given to a certain figure added to coats of arms, ſerving to diſtinguiſh one family from another; and to ſhow how diſtant younger branches are from the elder or principal branch.

DIFFERENTIAL, differentiale, in the higher geometry, an infinitely ſmall quantity, or a particle of quantity ſo ſmall as to be leſs than any aſſignable one. It is called a *differential*, or *differential quantity*, becauſe frequently conſidered as the difference of two quantities; and, as ſuch, is the foundation of the *differential calculus*: Sir Iſaac Newton, and the Engliſh, call it a *moment*, as being conſidered as the momentary increaſe of quantity. See Fluxions.

DIFFORM, Difformis (from *forma* "ſhape"), is a word uſed in oppoſition to *uniform*; and ſignifies, that there is no regularity in the form or appearance of a thing. The botaniſts uſe it as a diſtinction of the flowers of ſeveral ſpecies of plants.

DIFFUSE, an epithet applied to ſuch writings as are wrote in a prolix manner. Among hiſtorians, Salluſt is reckoned ſententious, and Livy diffuſe. Thus alſo among the orators, Demoſthenes is cloſe and conciſe; Cicero, on the other hand, is diffuſe.

DIFFUSION, the diſperſion of the ſubtile effluvia of bodies into a kind of atmoſphere all round them.

Thus the light diffuſed by the rays of the ſun, iſſues all round from that amazing body of fire.

DIGASTRICUS, in anatomy, a muſcle of the lower jaw, called alſo *Biventer*. See Anatomy, *Table of the Muſcles*.

DIGBY (Sir Kenelm), became very illuſtrious in the 17th century for his virtue and learning. He was deſcended of an ancient family in England. His great-grandfather, accompanied by ſix of his brothers, fought valiantly at Boſworth-field on the ſide of Henry VII. againſt the uſurper Richard III. His father, Everard, ſuffered himſelf to be engaged in the gun-powder plot againſt king James I. and for that crime was beheaded. His ſon wiped off that ſtain, and was reſtored to his eſtate. King Charles I. made him gentleman of the bed-chamber, commiſſioner of the navy, and governor of the Trinity-houſe. He granted him letters of repriſal againſt the Venetians, by virtue whereof he took ſeveral prizes with a ſmall fleet which he commanded. He fought the Venetians near the port of Scanderoon, and bravely made his way through them with his booty. He was a great lover of learning, and tranſlated ſeveral authors into Engliſh; and his "Treatiſe of the Nature of Bodies and the Immortality of the Soul," diſcovers great penetration and extenſive knowledge. He applied to chemiſtry; and found out ſeveral uſeful medicines, which he gave freely away to people of all ſorts, eſpecially to the poor. He diſtinguiſhed himſelf particularly by his ſympathetic powder for the cure of wounds at a diſtance; his diſcourſe concerning which made a great noiſe for a while. He had conferences with Des Cartes about the nature of the ſoul.

In the beginning of the civil wars, he exerted himſelf very vigorouſly in the king's cauſe; but he was afterwards impriſoned, by the parliament's order, in Wincheſter houſe, and had leave to depart thence in 1643. He afterwards compounded for his eſtate, but was ordered to leave the nation; when he went to France, and was ſent on two embaſſies to pope Innocent X. from the queen, widow to Charles I. whoſe chancellor he then was. On the reſtoration of Charles II. he returned to London; where he died in 1665, aged 60.

This eminent perſon was, for the early pregnancy of his parts, and his great proficiency in learning, compared to the celebrated Picus de Mirandola, who was one of the wonders of human nature. His knowledge, though various and extenſive, appeared to be greater than it really was; as he had all the powers of elocution and addreſs to recommend it. He knew how to ſhine in a circle of ladies or philoſophers; and was as much attended to when he ſpoke on the moſt trivial ſubjects, as when he ſpoke on the moſt important. It is ſaid that one of the princes of Italy, who had no child, was deſirous that his princeſs ſhould bring him a ſon by Sir Kenelm, whom he eſteemed a juſt model of perfection.

DIGEST, Digestum, a collection of the Roman laws, ranged and digeſted under proper titles, by order of the emperor Juſtinian.

That prince gave his chancellor Tribonianus a commiſſion for this purpoſe; who, in conſequence thereof, choſe ſixteen juriſconſulti, or lawyers, to work upon the ſame. Theſe, accordingly, took out the beſt and fineſt deciſions from the two thouſand volumes of the ancient juriſconſulti, and reduced them all into one body; which was publiſhed in the year 533, under the name of the *Digeſt*. To this the emperor gave the force of a law, by a letter at the head of the work, which ſerves it as a preface.

The Digeſt makes the firſt part of the Roman law, and the firſt volume of the corpus or body of the civil law, contained in fifty books. It was tranſlated into Greek under the ſame emperor, and called *Pandecta*. See Pandects.

Cujus ſays, that *Digeſt* is a common name for all books diſpoſed in a good order and economy; and hence it is that Tertullian calls the Goſpel of St Luke a Digeſt.

Hence alſo abridgements of the common law are denominated *digeſts* of the numerous caſes, arguments, readings, pleadings, &c. diſperſed in the year-books, and other reports and books of law, reduced under proper heads or common places. The firſt was that of Statham, which comes as low as Henry VI. That of Fitzherbert was publiſhed in 1516; Brook's in 1573, of which Hughes's, publiſhed in 1663, is a ſequel. Rolls, Danvers, and Nelſon, have alſo publiſhed Digeſts or abridgements of this kind, including the caſes of later days; to which may be added the New Abridgement, Viner's Abridgement, &c.

DIGESTION, in the animal economy, is the diſſolution of the aliments into ſuch minute parts as are fit to enter the lacteal veſſels, and circulate with the maſs of blood. See Anatomy, n° 102.

Digestion, in chemiſtry, is an operation which conſiſts in expoſing bodies to a gentle heat, in proper veſſels, and during a certain time. This operation is very uſeful to favour the action of certain ſubſtances upon each other; as, for example, of well calcined, dry, fixed alkali upon rectified ſpirit of wine. When theſe two ſubſtances are digeſted together in a matraſs, with a gentle ſand-bath heat, the ſpirit of wine acquires a yellow-reddiſh colour, and an alkaline quality. The ſpirit would not ſo well acquire theſe qualities by a ſtronger and ſhorter heat.

DIGESTIVE, in medicine, ſuch remedies as ſtrengthen and increaſe the tone of the ſtomach, and aſſiſt in the digeſtion of foods. To this claſs belong all ſtomachics and ſtrengtheners or corroborants.

Digestive, in ſurgery, denotes a ſort of unguent, plaſter, or the like, that ripens and prepares the matter of wounds, &c. for ſuppuration.

DIGGING, among miners, is appropriated to the operation of freeing any kind of ore from the bed or ſtratum in which it lies, where every ſtroke of their tools turns to account: in contradiſtinction to the openings made in ſearch of ſuch ore, which are called *hatches*, or *eſſay-hatches*; and the operation itſelf, *tracing of mines*, or *hatching*.

When a bed of ore is diſcovered, the beele-men, ſo called from the inſtrument they uſe, which is a kind of pick-ax, free the ore from the foſſils around it; and the ſhovel-men throw it up from one ſhamble to another, till it reaches the mouth of the hatch.

In ſome mines, to ſave the expence as well as fatigue of the ſhovel-men, they raiſe the ore by means of a winder and two buckets, one of which goes up as the other comes down.

DIGIT, in aſtronomy, the twelfth part of the diameter of the ſun or moon, uſed to expreſs the quantity of an eclipſe. Thus an eclipſe is ſaid to be of ſix digits, when ſix of theſe parts are hid.

Digits, or *Monades*, in arithmetic, ſignify any integer under 10; as 1, 2, 3, 4, 5, 6, 7, 8, 9.

Digit is alſo a meaſure taken from the breadth of the finger. It is properly $\frac{3}{4}$ths of an inch, and contains the meaſure of four barley-corns laid breadthwiſe.

DIGITALIS, fox-glove: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 28th order, *Luridæ*. The calyx is quinquepartite; the corolla campanulated, quinquefid, and ventricoſe; the capſule ovate and bilocular.—There are ſix ſpecies; five of which are hardy, herbaceous, biennial, and perennial plants, and the ſixth a tender ſhrubby exotic. The herbaceous ſpecies riſe two or three feet high, crowned with ſpikes of yellow iron-coloured or purple flowers. The ſhrubby ſort riſes five or ſix feet high, having ſpear-ſhaped rough leaves, four or five inches long, and half as broad; the branches being all terminated with flowers growing in looſe ſpikes. All the ſpecies are eaſily raiſed by ſeeds. An ointment made of the flowers of purple fox-glove and May-butter, is much commended by ſome phyſicians for ſcrophulous ulcers which run much and are full of matter. Taken internally, this plant is a violent purgative and emetic; and is therefore only to be adminiſtered to robuſt conſtitutions. The country people in England frequently uſe a decoction of it with polypody of the oak in epileptic fits. An infuſion of two drams of the leaf in a pint of water, given in half-ounce doſes every two hours or ſo, till it begin to puke or purge, is recommended in dropſy, particularly that of the breaſt. It is ſaid to have produced an evacuation of water ſo copious and ſudden, in aſcites, by ſtool and urine, that the compreſſion of bandages was found neceſſary. The plentiful uſe of diluents is ordered during its operation. The remedy, however, is inadmiſſible in very weakly patients. But beſides being given in infuſion, it has alſo been employed in ſubſtance. And when taken at bed-time to the extent of one, two, or three, grains of the dried powder, it often in a ſhort time operates as a very powerful diuretic, without producing any other evacuation. Even this quantity, however, will ſometimes excite very ſevere vomiting, and that too occurring unexpectedly. During its operation it has often very remarkable influence in rendering the pulſe ſlower; and it frequently excites very conſiderable vertigo, and an affection of viſion. Fox-glove has of late alſo been employed in ſome inſtances of hæmoptyſis, of phthiſis, and of mania, with apparent good effects: but its uſe in theſe diſeaſes is much leſs common than in dropſy.

DIGITATED, among botaniſts. See Botany, p. 445, n° 230, and Plate CV. fig. 102.

DIGLYPH, in architecture, a kind of imperfect triglyph, conſole, or the like; with two channels or engravings, either circular or angular.

DIGNE, an epiſcopal town of Provence in France, famous for the baths that are near it. It is ſeated on a river called Marderic, in E. Long. 5. 27. N Lat. 44. 45.

DIGNITARY, in the canon law, a perſon who holds a dignity, that is, a benefice which gives him ſome pre-eminence over mere prieſts and canons. Such is a biſhop, dean, arch deacon, prebendary, &c.

DIGNITY, as applied to the titles of noblemen, ſignifies honour and authority. And dignity may be divided into ſuperior and inferior; as the titles of duke, earl, baron, &c. are the higheſt names of dignity; and thoſe of baronet, knight, ſerjeant at law, &c. the loweſt. Nobility only can give ſo high a name of dignity as to ſupply the want of a ſurname in legal proceedings; and as the omiſſion of a name of dignity may be pleaded in abatement of a writ, &c. ſo it may be where a peer who has more than one name of dignity, is not named by the Moſt Noble. No temporal dignity of any foreign nation can give a man a higher title here than that of esquire.

Dignity, in the human character, the oppoſite of *Meanneſs*.

Man is endued with a sense of the worth and excellence of his nature: he deems it more perfect than that of the other beings around him; and he perceives that the perfection of his nature conſiſts in virtue, particularly in virtues of the higheſt rank. To expreſs that ſenſe, the term *dignity* is appropriated. Further, to behave with dignity, and to refrain from all mean actions, is felt to be, not a virtue only, but a duty: it is a duty every man owes to himſelf. By acting in that manner, he attracts love and eſteem: by acting meanly, or below himſelf, he is diſapproved and contemned.

This ſenſe of the dignity of human nature reaches even our pleaſures and amuſements. If they enlarge the mind by raiſing grand or elevated emotions, or if they humanize the mind by exerciſing our ſympathy, they are approved as ſuited to the dignity of our nature: if they contract the mind by fixing it on trivial objects, they are contemned as not ſuited to the dignity of our nature. Hence, in general, every occupation, whether of uſe or amuſement, that correſponds to the dignity of man, is termed *manly;* and every occupation below his nature, is termed *childiſh*.

To thoſe who ſtudy human nature, there is a point which has always appeared intricate: How comes it that generoſity and courage are more eſteemed, and beſtow more dignity, than good-nature, or even juſtice; though the latter contribute more than the former to private as well as to public happineſs? This queſtion, bluntly propoſed, might puzzle even a philoſopher; but, by means of the foregoing obſervations, will eaſily be ſolved. Human virtues, like other objects, obtain a rank in our eſtimation, not from their utility, which is a ſubject of reflection, but from the direct impreſſion they make on us. Juſtice and good-nature are a ſort of negative virtues, that ſcarce make any impreſſion but when they are tranſgreſſed: courage and generoſity, on the contrary, producing elevated emotions, enliven greatly the ſenſe of a man's dignity, both in himſelf and in others; and for that reaſon, courage and generoſity are in higher regard than the other virtues mentioned: we deſcribe them as grand and elevated, as of greater dignity, and more praiſe-worthy.

This leads us to examine more directly emotions and paſſions with reſpect to the preſent ſubject: and it will not be difficult to form a ſcale of them, beginning with the

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the meaneſt, and aſcending gradually to thoſe of the higheſt rank and dignity. Pleaſure felt as at the organ of ſenſe, named *corporeal pleaſure*, is perceived to be low; and when indulged to exceſs, is perceived alſo to be mean: for that reaſon, perſons of any delicacy diſſemble the pleaſure they take in eating and drinking. The pleaſures of the eye and ear, having no organic feeling, and being free from any ſenſe of meanneſs, are indulged without any ſhame: they even riſe to a certain degree of dignity when their objects are grand or elevated. The ſame is the caſe of the ſympathetic paſſions: a virtuous perſon behaving with fortitude and dignity under cruel misfortunes, makes a capital figure; and the ſympathiſing ſpectator feels in himſelf the ſame dignity. Sympathetic diſtreſs at the ſame time never is mean: on the contrary, it is agreeable to the nature of a ſocial being, and has general approbation. The rank that love poſſeſſes in the ſcale, depends in a great meaſure on its object: it poſſeſſes a low place when founded on external properties merely; and is mean when beſtowed on a perſon of inferior rank without any extraordinary qualification: but when founded on the more elevated internal properties, it aſſumes a conſiderable degree of dignity. The ſame is the caſe of friendſhip. When gratitude is warm, it animates the mind; but it ſcarce riſes to dignity. Joy beſtows dignity when it proceeds from an elevated cauſe.

If we can depend upon induction, dignity is not a property of any diſagreeable paſſion: one is ſlight, another ſevere; one depreſſes the mind, another animates it; but there is no elevation, far leſs dignity, in any of them. Revenge, in particular, though it enflame and ſwell the mind, is not accompanied with dignity, not even with elevation: it is not however felt as mean or groveling, unleſs when it takes indirect meaſures for gratification. Shame and remorſe, though they ſink the ſpirits, are not mean. Pride, a diſagreeable paſſion, beſtows no dignity in the eye of a ſpectator. Vanity always appears mean; and extremely ſo where founded, as commonly happens, on trivial qualifications.

We proceed to the pleaſures of the underſtanding, which poſſeſs a high rank in point of dignity. Of this every one will be ſenſible, when he conſiders the important truths that have been laid open by ſcience; ſuch as general theorems, and the general laws that govern the material and moral worlds. The pleaſures of the underſtanding are ſuited to man as a rational and contemplative being, and they tend not a little to ennoble his nature; even to the Deity he ſtretcheth his contemplations, which, in the diſcovery of infinite power, wiſdom, and benevolence, afford delight of the moſt exalted kind. Hence it appears, that the fine arts, ſtudied as a rational ſcience, afford entertainment of great dignity; ſuperior far to what they afford as a ſubject of taſte merely.

But contemplation, however in itſelf valuable, is chiefly reſpected as ſubſervient to action; for man is intended to be more an active than a contemplative being. He accordingly ſhows more dignity in action than in contemplation: generoſity, magnanimity, heroiſm, raiſe his character to the higheſt pitch: theſe beſt expreſs the dignity of his nature, and advance him nearer to divinity than any other of his attributes.

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Having endeavoured to aſſign the efficient cauſe of dignity and meanneſs, by unfolding the principle on which they are founded, we proceed to explain the final cauſe of the dignity or meanneſs beſtowed upon the ſeveral particulars above mentioned, beginning with corporeal pleaſures. Theſe, as far as uſeful, are, like juſtice, fenced with ſufficient ſanctions to prevent their being neglected: hunger and thirſt are painful ſenſations; and we are incited to animal love by a vigorous propenſity: were corporeal pleaſures dignified over and above with a place in a high claſs, they would infallibly overturn the balance of the mind, by outweighing the ſocial affections. This is a ſatisfactory final cauſe for refuſing to theſe pleaſures any degree of dignity: and the final cauſe is not leſs evident of their meanneſs when they are indulged to exceſs. The more refined pleaſures of external ſenſe, conveyed by the eye and the ear from natural objects and from the fine arts, deſerve a high place in our eſteem, becauſe of their ſingular and extenſive utility: in ſome caſes they riſe to a conſiderable dignity; and the very loweſt pleaſures of the kind are never eſteemed mean or groveling. The pleaſure ariſing from wit, humour, ridicule, or from what is ſimply ludicrous, is uſeful, by relaxing the mind after the fatigue of more manly occupation: but the mind, when it ſurrenders itſelf to pleaſure of that kind, loſes its vigour, and ſinks gradually into ſloth. The place this pleaſure occupies in point of dignity, is adjuſted to theſe views: to make it uſeful as a relaxation, it is not branded with meanneſs; to prevent its uſurpation, it is removed from that place but a ſingle degree: no man values himſelf for that pleaſure, even during gratification; and if it have engroſſed more of his time than is requiſite for relaxation, he looks back with ſome degree of ſhame.

In point of dignity, the ſocial emotions riſe above the ſelfiſh, and much above thoſe of the eye and ear: man is by his nature a ſocial being; and to qualify him for ſociety, it is wiſely contrived, that he ſhould value himſelf more for being ſocial than ſelfiſh.

The excellency of man is chiefly diſcernible in the great improvements he is ſuſceptible of in ſociety: theſe, by perſeverance, may be carried on progreſſively, above any aſſignable limits; and even abſtracting from revelation, there is great probability, that the progreſs begun here will be completed in ſome future ſtate. Now, as all valuable improvements proceed from the exerciſe of our rational faculties, the Author of our nature, in order to excite us to a due uſe of theſe faculties, hath aſſigned a high rank to the pleaſures of the underſtanding: their utility, with reſpect to this life as well as a future, intitles them to that rank.

But as action is the aim of all our improvements, virtuous actions juſtly poſſeſs the higheſt of all the ranks. Theſe, we find, are by nature diſtributed into different claſſes, and the firſt in point of dignity aſſigned to actions that appear not the firſt in point of uſe: generoſity, for example, in the ſenſe of mankind is more reſpected than juſtice, though the latter is undoubtedly more eſſential to ſociety; and magnanimity, heroiſm, undaunted courage, riſe ſtill higher in our eſteem: The reaſon of which is explained above.

Dignity, in oratory, is one of the three parts of general elocution; and conſiſts in the right uſe of tropes and figures. See Oratory, n° 48.

DIGON, an ancient, handſome, rich, and very conſiderable town of France; capital of Burgundy, and of the Digonois; with a parliament, biſhop's ſee, a mint, an univerſity, academy of ſciences, an abbey, and a citadel: moſt part of the churches and public ſtructures are very beautiful, and in one of the ſquares there is an equeſtrian ſtatue of Louis XIV. It is ſeated in a very pleaſant plain between two ſmall rivers, which produces excellent wine. E. Long. 5. 7. N. Lat. 47. 19.

DIGRESSION, in oratory, is defined by Quintilian, agreeably to the etymology of the word, to be, a going off from the ſubject we are upon to ſome different thing, which, however, may be of ſervice to it. See Oratory, n° 37.

DIGYNIA, (from δις *twice*, and γυνη a *woman)*, the name of an order or ſecondary diviſion in each of the firſt 13 claſſes, except the 9th, in Linnæus's ſexual method; conſiſting of plants, which to the claſſic character, whatever it is, add the circumſtance of having two ſtyles or female organs.

DII, the divinities of the ancient inhabitants of the earth, were very numerous. Every object which cauſed terror, inſpired gratitude, or beſtowed affluence, received the tribute of veneration. Man ſaw a ſuperior agent in the ſtars, the elements, or the trees, and ſuppoſed that the waters which communicated fertility to his fields and poſſeſſions, were under the influence and direction of ſome inviſible power inclined to favour and to benefit mankind. Thus aroſe a train of divinities which imagination arrayed in different forms, and armed with different powers. They were endowed with underſtanding, and were actuated by the ſame paſſions which daily afflict the human race, and thoſe children of ſuperſtition were appeaſed or provoked as the imperfect being which gave them birth. Their wrath was mitigated by ſacrifices and incenſe, and ſometimes human victims bled to expiate a crime, which ſuperſtition alone ſuppoſed to exiſt. The ſun, from his powerful influence and animating nature, firſt attracted the notice and claimed the adoration of the uncivilized inhabitants of the earth. The moon alſo was honoured with ſacrifices and addreſſed in prayers, and after immortality had been liberally beſtowed on all the heavenly bodies, mankind claſſed among their deities the brute creation, and the cat and the ſow ſhared equally with Jupiter himſelf, the father of gods and men, the devout veneration of their votaries. This immenſe number of deities have been divided into different claſſes according to the will and pleaſure of the mythologiſts. The Romans, generally ſpeaking, reckoned two claſſes of the gods, the *dii majorum gentium*, or *dii conſulentes*, and the *dii minorum gentium*. The former were 12 in number, ſix males and ſix females. [*Vid.* Consentes.] In the claſs of the latter were ranked all the gods which were worſhipped in different parts of the earth. Beſides theſe there were ſome called *dii ſelecti*, ſometimes claſſed with the 12 greater gods; theſe were Janus, Saturn, the Genius, the Moon, Pluto, and Bacchus. There were alſo ſome called demi-gods, that is, who deſerved immortality by the greatneſs of their exploits, and for their uncommon ſervices to mankind. Among theſe were Priapus, Vertumnus, Hercules, and thoſe whoſe parents were ſome of the immortal gods. Beſides theſe, all the paſſions and the moral virtues were reckoned as powerful deities, and temples were raiſed to a goddeſs of concord, peace, &c. According to the authority of Heſiod, there were no leſs than 30.000 gods that inhabited the earth, and were guardians of men, all ſubſervient to the power of Jupiter. To theſe, ſucceeding ages have added an almoſt equal number; and indeed they were ſo numerous, and their functions ſo various, that we find temples erected, and ſacrifices offered, to unknown gods. It is obſervable, that all the gods of the ancients have lived upon earth as mere mortals; and even Jupiter, who was the ruler of heaven, is repreſented by the mythologiſts as a helpleſs child; and we are acquainted with all the particulars that attended the birth and education of Juno. In proceſs of time, not only good and virtuous men, who had been the patrons of learning and the ſupporters of liberty, but alſo thieves and pirates, were admitted among the gods, and the Roman ſenate courteouſly granted immortality to the moſt cruel and abandoned of their emperors.

DIJAMBUS, in poetry, the foot of a Latin verſe of four ſyllables; it is compounded of two *iambics*, as *ſĕvērĭtās*.

DIKE, a ditch or drain, made for the paſſage of waters.—The word ſeems formed from the verb to *dig*; tho' others chooſe to derive it from the Dutch, *diik*, a dam, ſea-bank, or wall.

Dike, or *Dyke*, alſo denotes a work of ſtone, timber or faſcines, raiſed to oppoſe the entrance or paſſage of the waters of the ſea, a river, lake, or the like. —The word comes from the Flemiſh *dyk*, or *diik*, a heap of earth to bound or ſtem the water. Junius and Menage take the Flemiſh to have borrowed their word from the Greek τειχος, *wall*. Guichard derives it from the Hebrew *daghah*. Theſe dikes are uſually elevations of earth, with hurdles of ſtakes, ſtones, and other matters.

The dike of Rochelle is made with veſſels faſtened to the bottom. The dikes of Holland are frequently broke through, and drown large tracts of land.

DILAPIDATION, in law, a waſteful deſtroying or letting buildings, eſpecially parſonage-houſes, &c. run to decay, for want of neceſſary reparation. If the clergy neglect to repair the houſes belonging to their benefices, the biſhop may ſequeſter the profits thereof for that purpoſe. And in theſe caſes, a proſecution may be brought either in the ſpiritual court or at common law, againſt the incumbent himſelf, or againſt his executor or adminiſtrator.

DILATATION, in phyſics, a motion of the parts of any body, by which it is ſo expanded as to occupy a greater ſpace. This expanſive motion depends upon the elaſtic power of the body; whence it appears that dilatation is different from rarefaction, this laſt being produced by the means of heat.

DILATATORES, in anatomy, a name given to ſeveral muſcles in the human body. See Anatomy, *Table of the Muſcles*.

DILATORY pleas, in law, are ſuch as are put in merely for delay; and there may be a demurrer to a dilatory plea, or the defendant ſhall be ordered to plead better, &c. The truth of dilatory pleas is to be made out by affidavit of the fact, &c. by ſtat. 4 and 5 Anne. See PLEA.

DILATRIS, in botany: A genus of the monogynia order, belonging to the triandria claſs of plants. There is no calyx; the corolla has ſix petals, and is ſhaggy; the ſtigma ſimple.

DILEMMA, in logic, an argument equally concluſive by contrary ſuppoſitions. See LOGIC.

DILIGENCE, in Scots law, ſignifies either that care and attention which parties are bound to give, in implementing certain contracts or truſts, and which varies according to the nature of the contract; as to which, ſee LAW, N° clxi. 12, 13. clxxiii. 8. & clxxxi. 18. Or it ſignifies certain forms of law, whereby the creditor endeavours to operate his payment, either by affecting the perſon or eſtate of the debtor; *ibid.* N° clxxi. clxxii.

DILL, in botany. See ANETHUM.

DILLEMBURG, a town of Germany, in Wetteravia, and capital of a county of the ſame name. It is ſubject to a prince of the houſe of Naſſau, and is ſituated in E. Long. 8. 24. N. Lat. 50. 45.

DILLENGEN, a town of Germany, in the circle of Suabia, with an univerſity, and where the biſhop of Augſburg reſides. It is ſeated near the Danube, in E. Long. 11. 35. N. Lat. 48. 38.

DILLENIA, in botany, a genus of the polygynia belonging to the polyandria claſs of plants. The calyx is pentaphyllous; the petals five; the capſules numerous, polyſpermous, coalited, and full of pulp.

DILUTE. To dilute a body is to render it liquid; or, if it were liquid before, to render it more ſo, by the addition of a thinner thereto. Theſe things thus added are called *diluents*, or *dilutors*.

DIMACHÆ, (from δις *double*, and μαχω *I fight*,) in antiquity, a kind of horſemen, firſt inſtituted by Alexander. Their armour was lighter than that of the infantry, and at the ſame time heavier than that uſed by horſemen, ſo that they could act as horſe or foot as occaſion required.

DIMENSION, in geometry, is either length, breadth, or thickneſs; hence, a line hath one dimenſion, *viz.* length; a ſuperficies two, *viz.* length and breadth; and a body, or ſolid, has three, *viz.* length, breadth, and thickneſs.

DIMINUTION, in architecture, a contraction of the upper part of a column, by which its diameter is made leſs than that of the lower part*.

* See *Architecture*, n° 38.

DIMINUTIVE, in grammar, a word formed from ſome other, to ſoften or diminiſh the force of it, or to ſignify a thing is little in its kind. Thus, *cellule* is a diminutive of *cell*, globule of *globe*, hillock of *hill*.

DIMISSORY LETTERS, *Literæ Dimiſſoriæ*, in the canon law, a letter given by a biſhop to a candidate for holy orders, having a title in his dioceſe, directed to ſome other biſhop, and giving leave for the bearer to be ordained by him.

When a perſon produces letters of ordination or tonſure, conferred by any other than his own dioceſan, he muſt at the ſame time produce the letters dimiſſory given by his own biſhop, on pain of nullity.

Letters dimiſſory cannot be given by the chapter, *ſede vacante*; this being deemed an act of voluntary juriſdiction, which ought to be reſerved to the ſucceſſor.

DIMŒRITÆ, a name given to the Apollinariſts, who at firſt held, that the word only aſſumed a human body, without taking a reaſonable ſoul like ours; but being at length convinced by formal texts of ſcripture, they allowed, that he did aſſume a ſoul, but without underſtanding; the word ſupplying the want of that faculty. From this way of ſeparating the underſtanding from the ſoul, they became denominated *dimœrites*, q. d. *dividers*, *ſeparaters*, of δια and μοιραω, *I divide*.

DINDYMA-ORUM, (Virgil,) from Dindymus-i; a mountain allotted by many to Phrygia. Strabo has two mountains of this name; one in Myſia near Cyzicus; the other in Gallograecia near Peſſinûs; and none in Phrygia. Ptolemy extends this ridge from the borders of Troas, through Phrygia to Gallograecia: though therefore there were two mountains called Dindymus in particular, both ſacred to the mother of the gods, and none of them in Phrygia Major; yet there might be ſeveral hills and eminences in it, on which this goddeſs was worſhipped, and therefore called *Dindyma* in general. Hence Cybele is ſurnamed *Dindymane*, (Horace.)

DINGWAL, a parliament-town of Scotland in the ſhire of Roſs, ſeated on the frith of Cromarty, 15 miles weſt of the town of Cromarty. Near it runs the river Conel, famous for producing pearls. W. Long. 4. 15. N. Lat. 57. 45. Dingwal was a Scotch barony in the perſon of the duke of Ormond in right of his lady, but forfeited in 1715.

DINNER, the meal taken about the middle of the day.—The word is derived from the French *diſner*, which Du Cange derives from the barbarous Latin *diſnare*. Henry Stephens derives it from the Greek δειπνον; and will have it wrote *dipner*. Menage deduces it from the Italian *deſinare*, "to dine"; and that from the Latin *deſinere*, "to leave off work."

It is generally agreed to be the moſt ſalutary to make a plentiful dinner, and to eat ſparingly at ſupper. This is the general practice among us. The French, however, in imitation of the ancient Romans, defer their good cheer to the evening; and Bernardinus Paternus, an eminent Italian phyſician, maintains it to be the moſt wholeſome method, in a treatiſe expreſsly on the ſubject.

The grand Tartar emperor of China, after he has dined, makes publication by his heralds, that he gives leave for all the other kings and potentates of the earth to go to dinner; as if they waited for his leave.

DINOCRATES, a celebrated architect of Macedonia, who rebuilt the temple of Epheſus, when burnt by Eroſtratus, with much more magnificence than before. Vitruvius informs us that Dinocrates propoſed to Alexander the Great to convert mount Athos into the figure of a man, whoſe left hand ſhould contain a walled city, and all the rivers of the mount flow into his right, and from thence into the ſea! He alſo conceived a ſcheme for building the dome of the temple of Arſinoe at Alexandria, of loadſtone; that ſhould by its attraction uphold her iron image in the centre, ſuſpended in the air! Projects which at leaſt ſhowed a vaſt extent of imagination.

DIO CHRYSOSTOM that is, *Golden Mouth*, a celebrated orator and philoſopher of Greece, in the firſt century, was born at Pruſa in Bithynia. He attempted to perſuade Veſpaſian to quit the empire; was hated by Domitian; but acquired the eſteem of Trajan This laſt prince took pleaſure in converſing with him, and made him ride with him in his triumphal chariot. There are ſtill extant, 80 of Dio's orations, and ſome other of his works: the beſt edition of which is that of Hermand Samuel Raimarus, in 1750, in folio.

DIOCESE, or DIOCESS, the circuit or extent of the juriſdiction of a BISHOP.—The word is formed from the Greek διοικησις, *government*, *adminiſtration*; formed of διοικεω, which the ancient gloſſaries render *adminiſtro*, *moderor*, *ordino*: hence διοικησις της πολεως, the *adminiſtration* or *government of a city*.

DIOCESE is alſo uſed in ancient authors, &c. for the province of a METROPOLITAN.

*Diocæſis*, διοικησις, was originally a civil government, or prefecture, compoſed of divers provinces.

The firſt diviſion of the empire into dioceſes is ordinarily aſcribed to Conſtantine; who diſtributed the whole Roman ſtate into four, viz. the dioceſe of Italy, the dioceſe of Illyria, that of the eaſt, and that of Africa. And yet, long before Conſtantine, Strabo, who wrote under Tiberius, takes notice, lib. xiii. p 432. that the Romans had divided Aſia into dioceſes; and complains of the confuſion ſuch a diviſion occaſioned in geography, Aſia being no longer divided by people, but by dioceſes, each whereof had a tribunal or court, where juſtice was adminiſtered. Conſtantine, then, was only the inſtitutor of thoſe large dioceſes, which comprehended ſeveral metropoles and governments; the former dioceſes only comprehending one juriſdiction or diſtrict, or the country that had reſort to one judge, as appears from this paſſage in Strabo, and (before Strabo) from Cicero himſelf, lib. iii. *epiſt, ad famil.* 9. and lib. xiii. *ep.* 67.

Thus, at firſt a province included divers dioceſes; and afterwards a dioceſe came to compriſe divers provinces. In after times the Roman empire became divided into 13 dioceſes or prefectures; though, including Rome, and the ſuburbicary regions, there were 14. Theſe 14 dioceſes comprehended 120 provinces: each province had a proconſul, who reſided in the capital or metropolis; and each dioceſe of the empire had a conſul, who reſided in the principal city of the diſtrict.

On this civil conſtitution, the eccleſiaſtical one was afterwards regulated: each dioceſe had an eccleſiaſtical vicar or primate, who judged finally of all the concerns of the church within his territory.

At preſent there is ſome further alteration: for dioceſe does not now ſignify an aſſemblage of divers provinces; but is limited to a ſingle province under a metropolitan, or more commonly to the ſingle juriſdiction of a biſhop.

Gul. Brito affirms dioceſe to be properly the territory and extent of a baptiſmal or parochial church; whence divers authors uſe the word to ſignify a ſimple pariſh. See PARISH.

DIOCLEIA, Διοκλεια, in antiquity, a ſolemnity kept in the ſpring at Megara, in memory of the Athenian hero, who died in the defence of the youth he loved.

DIOCLESIANUS (Caius Valerius Jorius), a celebrated Roman emperor born of an obſcure family in Dalmatia in 245. He was firſt a common ſoldier, and by merit and ſucceſs he gradually roſe to the office of a general; and at the death of Numerian in 284 he was inveſted with imperial power. In this high ſtation he rewarded the virtues and fidelity of Maximian, who had ſhared with him all the ſubordinate offices in the army, by making him his colleague on the throne. He created two ſubordinate emperors Conſtantius and Galerius, whom he called Cæſars, whilſt he claimed for himſelf and his colleague the ſuperior title of Auguſtus. Diocleſian has been celebrated for his military virtues; and though he was naturally unpoliſhed by education and ſtudy, yet he was the friend and patron of learning and true genius. He was bold and reſolute, active and diligent, and well acquainted with the arts, which will endear a ſovereign to his people, and make him reſpectable even in the eyes of his enemies. His cruelty, however, againſt the followers of Chriſtianity, has been deſervedly branded with infamy. After he had reigned 22 years in the greateſt proſperity, he publicly abdicated the crown at Nicomedia in 305, and retired to a private ſtation at Salona. Maximian his colleague followed his example, but not from voluntary choice; and when he ſome time after endeavoured to rouſe the ambition of Diocleſian, and perſuade him to re-aſſume the imperial purple, he received for anſwer, that Diocleſian took now more delight in cultivating his little garden than he formerly enjoyed in a palace, when his power was extended over all the earth. He lived nine years after his abdication in the greateſt ſecurity and enjoyment at Salona, and died in 314, in the 68th year of his age. Diocleſian is the firſt ſovereign who voluntarily reſigned his power. His bloody perſecution of the Chriſtians forms a chronological era, called the *era of Diocleſian*, or of the martyrs. It was for a long time in uſe in theological writings, and is ſtill followed by the Copts and Abyſſinians. It commenced Auguſt 29. 284.

DIOCTAHEDRIA, in natural hiſtory, a genus of pellucid and cryſtalliform ſpars, compoſed of two octangular pyramids, joined baſe to baſe, without any intermediate column. Of theſe ſome have long pyramids, others ſhort and ſharp-pointed ones, and others ſhort and obtuſe-pointed ones; the two former ſpecies being found in the Hartz-foreſt, and the laſt in the mines of Cornwall.

DIODATI (John), a famous miniſter, and profeſſor of theology at Geneva, was born at Lucca in 1579, and died at Geneva in 1652. He is diſtinguiſhed by tranſlations, 1. of the Bible into Italian, with notes, Geneva 1607, 4to. The beſt edition at Geneva in 1641, folio. This is ſaid to be more a paraphraſe than a tranſlation, and the notes rather divine meditations than critical reflections. 2. Of the Bible into French, Geneva, 1644. 3. Of Father Paul's Hiſtory of the Council of Trent into French.

DIODIA, in botany: A genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 47th order, *Stellatæ*. The corolla is monopetalous and funnel-ſhaped; the capſule bilocular and diſpermous.

DIODON, or SUN-FISH, in ichthyology, a genus belonging to the order of amphibia nantes.

There are three ſpecies. 1. The oblong ſun-fiſh grows to a great bulk: one examined by Sylvianus was above 100 pounds in weight; and Dr Borlaſe mentions another taken at Plymouth in 1734, that weighed 500. In form it reſembles a bream or ſome deep fiſh cut off in the middle. The mouth is very ſmall, and contains in each jaw two broad teeth, with ſharp edges. The eyes are little; before each is a ſmall ſemilunar aperture; the pectoral fins are very ſmall, and placed behind them. The colour of the back is duſky, and dappled; the belly ſilvery: between the eyes and the pectoral fins are certain ſtreaks pointing downwards. The ſkin is free from ſcales.

When boiled, it has been obſerved to turn into a glutinous jelly, reſembling boiled ſtarch when cold, and ſerved the purpoſes of glue on being tried on paper and leather. The meat of this fiſh is uncommonly rank: it feeds on ſhell-fiſh.

There ſeems to be no ſatisfactory reaſon for the old Engliſh name. Care muſt be taken not to confound it with the ſun-fiſh of the Iriſh (ſee SQUALUS), which differs in all reſpects from this.

2. The mola, or ſhort ſun-fiſh, differs from the former, in being much ſhorter and deeper. The back and the anal fins are higher, and the aperture to the gills not ſemilunar, but oval. The ſituation of the fins are the ſame in both.

Both kinds are taken on the weſtern coaſts of this kingdom, but in much greater numbers in the warmer parts of Europe.—Mr Brunnich informs us, that between Antibes and Genoa he ſaw one of this ſpecies lie aſleep on the ſurface of the water: a ſailor jumped overboard and caught it.

See Plate CLXIV. 3. The levigatus, or globe, is common to Europe and South Carolina. As yet only a ſingle ſpecimen has been diſcovered in our ſeas; taken at Penzance in Cornwall. The length was one foot ſeven: the length of the belly, when diſtended, one foot; the whole circumference in that ſituation two feet ſix. The form of the body is uſually oblong; but when alarmed, it has the power of inflating the belly to a globular ſhape of great ſize. This ſeems deſigned as a means of defence againſt fiſh of prey: as they have leſs means of laying hold of it; and are beſides terrified by the numbers of ſpines with which that part is armed, and which are capable of being erected on every part. The mouth is ſmall: the irides white, tinged with red: the back from head to tail almoſt ſtraight, or at leaſt very ſlightly elevated; of a rich deep blue colour. It has the pectoral, but wants the ventral fins: the tail is almoſt even, divided by an angular projection in the middle; tail and fins brown. The belly and ſides are white, ſhagreened or wrinkled; and beſet with innumerable ſmall ſharp ſpines, adhering to the ſkin by four proceſſes.

DIODORUS, an hiſtorian, ſurnamed *Siculus*, becauſe he was born at Argyra in Sicily. He wrote an hiſtory of Egypt, Perſia, Syria, Media, Greece, Rome, and Carthage; and it is ſaid that he viſited all the places of which he has made mention in his hiſtory. It was the labour of 30 years. He is, however, too credulous in ſome of his narrations; and often wanders far from the truth. He often dwells too long upon fabulous reports and trifling incidents; while events of the greateſt importance to hiſtory are treated with brevity, and ſometimes paſſed over in ſilence. He lived in the age of J. Cæſar and Auguſtus; and ſpent much time at Rome to procure information, and authenticate his hiſtorical narrations. This important work, which he compoſed in Greek, contained 40 books, of which there are only 15 remaining. The ſtyle is clear and neat, and very ſuitable to hiſtory. The beſt edition is that of Amſterdam, 1743, in 2 vols folio.

DIOECIA, (from δις *twice*, and οικια a *houſe* or *habitation*) two houſes. The name of the 22d claſs in Linnæus's ſexual method, conſiſting of plants, which having no hermaphrodite flowers, produce male and female flowers on ſeparate roots. Theſe latter only ripen ſeeds; but require for that purpoſe, according to the ſexualiſts, the vicinity of a male plant; or the aſperſion, that is, ſprinkling, of the male duſt. From the ſeeds of the female flowers are raiſed both male and female plants. The plants then in the claſs diœcia are all male and female; not hermaphrodite, as in the greater number of claſſes; nor with male and female flowers upon one root, as in the claſs monœcia of the ſame author. See BOTANY, p. 430.

DIOGENES of Apollonia, in the iſland of Crete, held a conſiderable rank among the philoſophers who taught in Ionia before Socrates appeared at Athens. He was the ſcholar and ſucceſſor of Anaximenes, and in ſome meaſure rectified his maſter's opinion concerning air being the cauſe of all things. It is ſaid, that he was the firſt who obſerved that air was capable of condenſation and rarefaction. He paſſed for an excellent philoſopher, and died about the 450th year before the Chriſtian era.

DIOGENES the Cynic, a famous philoſopher, was the ſon of a banker of Sinope in Pontus. Being baniſhed with his father for coining falſe money, he retired to Athens, where he ſtudied philoſophy under Antiſthenes. He added new degrees of auſterity to the ſect of the Cynics, and never did any philoſopher carry ſo far a contempt for the conveniences of life. He was one of thoſe extraordinary men who run every thing to extremity, without excepting even reaſon itſelf; and who confirm the ſaying, that "there is no great genius without a tincture of madneſs." He lodged in a tub; and had no other moveables beſides his ſtaff, wallet, and wooden bowl, which laſt he threw away on ſeeing a boy drink out of the hollow of his hand. He uſed to call himſelf a vagabond, who had neither houſe nor country; was obliged to beg, was ill clothed, and lived from hand to mouth: and yet, ſays Ælian, he took as much pride in theſe things as Alexander could in the conqueſt of the world. He was not indeed a jot more humble than thoſe who are clothed in rich apparel, and fare ſumptuouſly every day. He looked down on all the world with ſcorn; he magiſterially cenſured all mankind, and thought himſelf unqueſtionably ſuperior to all other philoſophers. Alexander one day paid him a viſit, and made him an offer of riches or any thing elſe: but all that the philoſopher requeſted of him was, to ſtand from betwixt the ſun and him. As if he had ſaid, "Do not deprive me of the benefits of nature, and I leave to you thoſe of fortune." The conqueror was ſo affected with the vigour and elevation of his ſoul, as to declare, that "if he was not Alexander, he would chooſe to be Diogenes:" that is, if he was not in poſſeſſion of all that was pompous and ſplendid in life, he would, like Diogenes, heroically deſpiſe it.

Diogenes had great preſence of mind, as appears from his ſmart ſayings and quick repartees; and Plato ſeems to have hit off his true character when he called him a Socrates run mad. He ſpent a great part of his life at Corinth, and the reaſon of his living there was as follows: As he was going over to the iſland of Ægina, he was taken by pirates, who carried him into Crete, and there expoſed him to ſale. He anſwered the crier, who aſked him what he could do, that "he knew how to command men:" and perceiving a Corinthian who was going by, he ſhowed him to the crier, and ſaid, "Sell me to that gentleman, for he wants a maſter." Xeniades, for that was the Corinthian's name, bought Diogenes, and carried him with him to Corinth. He appointed him tutor to his children, and entruſted him alſo with the management of his houſe. Diogenes's friends being deſirous of redeeming him, "You are fools, (ſaid he); the lions are not the ſlaves of thoſe who feed them, but they are the ſervants of the lions." He therefore plainly told Xeniades, that he ought to obey him, as people obey their governors and phyſicians. Some ſay, that Diogenes ſpent the remainder of his life in Xeniades's family; but Dion Chryſoſtom aſſerts that he paſſed the winter at Athens, and the ſummer at Corinth. He died at Corinth when he was about 90 years old: but authors are not agreed either as to the time or manner of his death. The following account, Jerom ſays, is the true one. As he was going to the Olympic games, a fever ſeized him in the way; upon which he lay down under a tree, and refuſed the aſſiſtance of thoſe who accompanied him, and who offered him either a horſe or a chariot. "Go you to the games. (ſays he), and leave me to contend with my illneſs. If I conquer, I will follow you: If I am conquered, I ſhall go to the ſhades below." He diſpatched himſelf that very night; ſaying, that "he did not ſo properly die, as get rid of his fever." He had for his diſciples Oneſicrites, Phocion, Stilpo of Megara, and ſeveral other great men. His works are loſt.

DIOGENES *Laertius*, ſo called from Laerta in Cilicia where he was born, an ancient Greek author, who wrote ten books of the Lives of the Philoſophers, ſtill extant. In what age he flouriſhed, is not eaſy to determine. The oldeſt writers who mention him are Sopater Alexandrinus, who lived in the time of Conſtantine the Great, and Heſychius Mileſius, who lived under Juſtinian. Diogenes often ſpeaks in terms of approbation of Plutarch and Phavorinus; and therefore, as Plutarch lived under Trajan, and Phavorinus under Hadrian, it is certain that he could not flouriſh before the reigns of thoſe emperors. Menage has fixed him to the time of Severus; that is, about the year of Chriſt 200. From certain expreſſions in him ſome have fancied him to have been a Chriſtian; but, as Menage obſerves, the immoderate praiſes he beſtows upon Epicurus will not ſuffer us to believe this, but incline us rather to ſuppoſe that he was an Epicurean. He divided his Lives into books, and inſcribed them to a learned lady of the Platonic ſchool, as he himſelf intimates in his life of Plato. Montaigne was ſo fond of this author, that inſtead of one Laertius he wiſhes we had a dozen; and Voſſius ſays, that his work is as precious as gold. Without doubt we are greatly obliged to him for what we know of the ancient philoſophers; and if he had been as exact in the writing part, as he was judicious in the choice of his ſubject, we had been more obliged to him ſtill. Biſhop Burnet, in the preface to his Life of Sir Matthew Hale, ſpeaks of him in the following proper manner: "There is no book the ancients have left us (ſays he), which might have informed us more than Diogenes Laertius's Lives of the Philoſophers, if he had had the art of writing equal to that great ſubject which he undertook: for if he had given the world ſuch an account of them as Gaſſendus has done of Peireſc, how great a ſtock of knowledge might we have had, which by his unſkilfulneſs is in a great meaſure loſt? ſince we muſt now depend only on him, becauſe we have no other and better author who has written on that argument." There have been ſeveral editions of his Lives of the Philoſophers; but the beſt is that printed in two volumes 4to, at Amſterdam, 1693. This contains the advantages of all the former, beſides ſome peculiar to itſelf: the Greek text and the Latin verſion corrected and amended by Meibomius; the entire notes of Henry Stephens, both the Caſaubons, and of Menage; 24 copper-plates of philoſophers elegantly engraved: to which is added, The Hiſtory of the Female Philoſophers, written by Menage, and dedicated to Madam Dacier. Beſides this, Laertius wrote a book of Epigrams upon illuſtrious Men, called Pammetrus, from its various kinds of metre: but this is not extant.

DIOMEDIA, in ornithology, a genus belonging to the order of anſeres. The bill is ſtrait; the ſuperior mandible is crooked at the point, and the lower one is truncated; the noſtrils are oval, open, a little prominent, and placed on the ſides. There are two ſpecies, viz. 1. The exulans, has pennated wings, and three toes on each foot. It is the albatroſs of Edwards; and is about the ſize of a pelican. Theſe birds are found in the ocean betwixt the tropics and at the Cape of Good Hope. They are alſo often ſeen in vaſt flocks in Kamtſchatka, and adjacent iſlands, about the end of June, where they are called *Great Gulls*; but it is chiefly in the bay of Penſchinenſi, the whole inner ſea of Kamtſchatka, the Kurile iſles, and that of Bering; for on the eaſtern coaſts of the firſt they are ſcarce, a ſingle ſtraggler only appearing now and then. Their chief motive for frequenting theſe places ſeems to be plenty of food; and their arrival is a ſure preſage of ſhoals of fiſh following. At their firſt coming they are very lean, but ſoon grow immenſely fat. Are very voracious birds, and will often ſwallow a ſalmon of four or five pounds weight; but as they cannot take the whole of it into their ſtomach at once, part of the tail end will often remain out of the mouth; and the natives, finding the bird in this ſituation, make no difficult matter of knocking it on the head on the ſpot. Before the middle of Auguſt they migrate elſewhere. They are often taken by means of a hook baited with a fiſh; but it is not for the ſake of their fleſh that they are valued, it being hard and unſavoury, but on account of the inteſtines, a particular part of which they blow up as a bladder, to ſerve as floats to buoy up their nets in fiſhing. Of the bones they make tobacco-pipes, needle-caſes, and other uſeful things. When caught they defend themſelves ſtoutly with the bill. Their cry is harſh and diſagreeable, not unlike the braying of an aſs. The breeding places of the albatroſs, if at all in the northern hemiſphere, have not yet been pointed out; but we are certain of their multiplying in the ſouthern, viz. Patagonia and Falkland iſlands: to this laſt place they come about the end of September or beginning of October, among other birds, in great abundance. The neſts are made on the ground with earth, are round in ſhape, a foot in height, indented at top. The egg larger than that of a gooſe, four inches and a half long, white, marked with dull ſpots at the bigger end; and is thought to be good food, the white never growing hard with boiling. While the female is ſitting, the male is conſtantly on the wing, and ſupplies her with food: during this time they are ſo tame as to ſuffer themſelves to be ſhoved off the neſt while their eggs are taken from them; but their chief deſtruction ariſes from the hawk, which, the moment the female gets off the neſt, darts thereon, and flies away with the egg. The albatroſs itſelf likewiſe has its enemy, being greatly perſecuted while on the wing by the dark grey gull called *ſkua*.

This bird attacks it on all ſides, but particularly endeavours to get beneath, which is only prevented by the firſt ſettling on the water; and indeed they do not frequently fly at a great diſtance from the ſurface, except obliged ſo to do by high winds or other cauſes. As ſoon as the young are able to remove from the neſt, the penguins take poſſeſſion, and hatch their young in turn. It is probable that they paſs from one part of the globe to another according to the ſeaſon; being now and then met with by different voyagers at various times in intermediate places. The food is ſuppoſed to be chiefly ſmall marine animals, eſpecially of the molluſcæ or blubber claſs, as well as flying fiſh. 2. The demerſa, has no quill-feathers on the wings; and the feet have four toes, connected together by a membrane. It is the black penguin of Edwards, about the ſize of a gooſe, and is found at the Cape of Good Hope. It is an excellent ſwimmer and diver; but hops and flutters in a ſtrange aukward manner on the land, and, if hurried, ſtumbles perpetually, and frequently runs for ſome diſtance like a quadruped, making uſe of the wings inſtead of legs, till it can recover its upright poſture; crying out at the ſame time like a gooſe, but in a much hoarſer voice. It is ſaid to clamber ſome way up the rocks in order to make the neſt; in doing which, has been obſerved to aſſiſt with the bill. The eggs are two in number, white, as large as thoſe of a duck, and reckoned delicious eating, at leaſt are thought ſo at the Cape, where they are brought in great numbers for that purpoſe. At this place the birds are often ſeen kept tame; but in general they do not ſurvive the confinement many months.

DIOMEDES, ſon of Tydeus and Deiphyle, was king of Ætolia, and one of the braveſt of the Grecian chiefs in the Trojan war. He often engaged Hector and Æneas, and obtained much military glory. He went with Ulyſſes to ſteal the Palladium from the temple of Minerva in Troy; and aſſiſted in murdering Rheſus king of Thrace, and carrying away his horſes. At his return from the ſiege of Troy, he loſt his way in the darkneſs of night, and landed in Attica, where his companions plundered the country and loſt the Trojan Palladium. During his long abſence, his wife Ægiale forgot her marriage vows, and proſtituted herſelf to Cometes one of her ſervants. This laſciviouſneſs of the queen was attributed by ſome to the reſentment of Venus, whom Diomedes had ſeverely wounded in a battle before Troy. The infidelity of Ægiale was highly diſpleaſing to Diomedes. He reſolved to abandon his native country which was the ſeat of his diſgrace; and the attempts of his wife to take away his life, according to ſome accounts, did not a little contribute to haſten his departure. He came to that part of Italy which has been called *Magna Græcia*, where he built a city, which he called *Argyrippa*, and married the daughter of Daunus the king of the country. He died there in extreme old age; or, according to a certain tradition, he periſhed by the hand of his father-in-law. His death was greatly lamented by his companions, who in the exceſs of their grief were changed into birds reſembling ſwans. Theſe birds took flight into a neighbouring iſland in the Adriatic, and became remarkable for the tameneſs with which they approached the Greeks, and for the horror with which they ſhunned all other nations. They are called the birds of Diomedes. Altars were raiſed to Diomedes, as to a god, one of which Strabo mentions at Timavus.

DION, a Syracuſan, ſon of Hipparinus, famous for his power and abilities. He was related to Dionyſius, and often adviſed him together with the philoſopher Plato, who at his requeſt had come to reſide at the tyrant's court, to lay aſide the ſupreme power. His great popularity rendered him odious in the eyes of the tyrants, who baniſhed him to Greece. There he collected a numerous force, and reſolved to free his country from tyranny. This he eaſily effected on account of his uncommon popularity. He entered the port of Syracuſe only in two ſhips; and in three days reduced under his power an empire which had already ſubſiſted for 50 years, and which was guarded by 500 ſhips of war, and above 100,000 troops. The tyrant fled to Corinth, and Dion kept the power in his own hands, fearful of the aſpiring ambition of ſome of the friends of Dionyſius: but he was ſhamefully betrayed and murdered by one of his familiar friends called *Callicrates*, or *Callippus*, 354 years before the Chriſtian era.

DION Cassius, a native of Nicæa in Bithynia. His father's name was Apronianus. He was raiſed to the greateſt offices of ſtate in the Roman empire by Pertinax, and his three ſucceſſors. He was naturally fond of ſtudy, and he improved himſelf by unwearied application. He was ten years in collecting materials for an hiſtory of Rome, which he made public in 80 books, after a laborious employment of 12 years in compoſing it. This valuable hiſtory began with the arrival of Æneas in Italy, down to the reign of the emperor Alexander Severus. The 34 firſt books are totally loſt, the 20 following, that is from the 35th to the 54th, remain entire, the ſix following are mutilated, and fragments is all that we poſſeſs of the laſt 20. In the compilation of this extenſive hiſtory, Dion propoſed himſelf Thucydides for a model, but he is not perfectly happy in his imitation. His ſtyle is pure and elegant, and his narrations are judiciouſly managed, and his reflections learned; but upon the whole, he is credulous, and the bigoted ſlave of partiality, ſatyr, and flattery. He inveighs againſt the republican principles of Brutus and Cicero, and extols the cauſe of Cæſar. Seneca is the object of his ſatyr, and he repreſents him as debauched and licentious in his morals.

DIONIS (Peter), a famous ſurgeon, born at Paris, diſtinguiſhed himſelf by his ſkill in his profeſſion, and by his works; the principal of which are, 1. A courſe of operations in ſurgery; 2. The anatomy of man; and, 3. A treatiſe on the manner of aſſiſting women in child-birth. He died in 1718.

DIONÆA MUSCIPULA, or *Venus's Fly-trap*, in botany, a newly diſcovered ſenſitive plant.

Every one ſkilled in natural hiſtory knows, that the mimoſæ, or ſenſitive plants, cloſe their leaves, and bend their joints, upon the leaſt touch: and this has aſtoniſhed us; but no end or deſign of nature has yet appeared to us from theſe ſurpriſing motions: they ſoon recover themſelves again, and their leaves are expanded as before. But the plant we are now going to deſcribe, ſhows that nature may have ſome view towards its nouriſhment, in forming the upper joint of its leaf like a machine to catch food: upon the middle of this lies the bait for the unhappy inſect that becomes its prey. Many minute red glands that cover its inner ſurface, and which perhaps diſcharge ſome ſweet liquor, tempt the poor animal to taſte them; and the inſtant theſe tender parts are irritated by its feet, the two lobes riſe up, graſp it faſt, lock the two rows of ſpines together, and ſqueeze it to death. And further, leſt the ſtrong efforts for life, in the creature thus taken, ſhould ſerve to diſengage it, three ſmall erect ſpines are fixed near the middle of each lobe among the glands, that effectually put an end to all its ſtruggles. Nor do the lobes ever open again, while the dead animal continues there. But it is nevertheleſs certain, that the plant cannot diſtinguiſh an animal from a mineral ſubſtance; for, if we introduce a ſtraw or a pin between the lobes, it will graſp it full as faſt as if it was an inſect.—The plant is one of the monogynia order, belonging to the decandria claſs. It grows in America, about 35 deg. N. Lat. in wet ſhady places, and flowers in July and Auguſt. The largeſt leaves are about three inches long, and an inch and half acroſs the lobes: the glands of thoſe expoſed to the ſun are of a beautiful red colour; but thoſe in the ſhade are pale, and inclining to green. The roots are ſquamous, ſending forth but few fibres, and are perennial. The leaves are numerous, inclining to bend downwards, and are placed in a circular order; they are jointed and ſucculent; the lower joint, which is a kind of ſtalk, is flat, longiſh, two-edged, and inclining to heart-ſhaped. In ſome varieties they are ſerrated on the edges near the top. The upper joint conſiſts of two lobes; each lobe is of a ſemi-oval form, with their margins furniſhed with ſtiff hairs like eye-brows, which embrace or lock in each other when they cloſe: this they do when they are inwardly irritated. The upper ſurfaces of theſe lobes are covered with ſmall red glands; each of which appears, when highly magnified, like a compreſſed arbutus berry.—Among the glands, about the middle of each lobe, are three very ſmall erect ſpines. When the lobes incloſe any ſubſtance, they never open again while it continues there. If it can be ſhoved out ſo as not to ſtrain the lobes, they expand again; but if force is uſed to open them, ſo ſtrong has nature formed the ſpring of their fibres, that one of the lobes will generally ſnap off rather than yield. The ſtalk is about ſix inches high, round, ſmooth, and without leaves; ending in a ſpike of flowers. The flowers are milk white, and ſtand on footſtalks, at the bottom of which is a little painted bractea or flower-leaf. The ſoil in which it grows, as appears from what comes about the roots of the plants when they are brought over, is a black, light, mould, intermixed with white ſand, ſuch as is uſually found in our mooriſh heaths. Being a ſwamp plant, a north-eaſt aſpect will be propereſt for it at firſt, to keep it from the direct rays of the ſun; and in winter, till we are acquainted with what cold weather it can endure, it will be neceſſary to ſhelter it with a bell glaſs, ſuch as is uſed for melons. This ſhould be covered with ſtraw or a mat in hard froſts. By this means ſeveral of theſe plants have been preſerved through the winter in a very vigorous ſtate. Its ſenſitive quality will be found in proportion to the heat of the weather, as well as the vigour of the plant. Our ſummers are not warm enough to ripen the ſeed; or poſſibly we are not yet ſufficiently acquainted with the culture of it. In order to try further experiments on its ſenſitive powers, ſome of the plants might be placed in pots of light mooriſh earth, and placed in pans of water, in an airy ſtove in ſummer; where the heat of ſuch a ſituation, being like that of its native country, will make it ſurpriſingly active.

DIONYSIA, in Grecian antiquity, ſolemnities in honour of Bacchus, ſometimes called by the general name of *Orgia*; and by the Romans *Bacchanalia*, and *Liberalia*. See BACCHANALIA and BACCHUS.

DIONYSIACA, in antiquity, was a deſignation given to plays and all manner of ſports acted on the ſtage; becauſe play-houſes were dedicated to Dionyſius, i. e. Bacchus and Venus, as being the deities of ſports and pleaſure.

DIONYSIAN PERIOD. See CHRONOLOGY, n° 31.

DIONYSIUS I. from a private ſecretary became general and tyrant of Syracuſe and all Sicily. He was likewiſe a poet; and having, by bribes, gained the tragedy-prize at Athens, he indulged himſelf ſo immoderately at table from exceſs of joy, that he died of the debauch, 386 B. C. but ſome authors relate that he was poiſoned by his phyſicians.

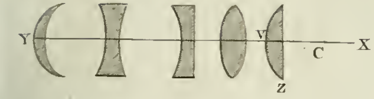
DIONYSIUS II. (his ſon and ſucceſſor) was a greater tyrant than his father: his ſubjects were obliged to apply to the Corinthians for ſuccour; and Timoleon their general having conquered the tyrant, he fled to Athens, where he was obliged to keep a ſchool for ſubſiſtence. He died 343 B. C.

DIONYSIUS (Halicarnaſſenſis), a celebrated hiſtorian, and one of the moſt judicious critics of antiquity, was born at Halicarnaſſus; and went to Rome after the battle of Actium, where he ſtaid 22 years under the reign of Auguſtus. He there compoſed in Greek his Hiſtory of the Roman Antiquities, in 20 books, of which the firſt 11 only are now remaining. There are alſo ſtill extant ſeveral of his critical works. The beſt edition of the works of this author is that of

# DIOPTRICS.

Plate CLXII.

Fig. 2.



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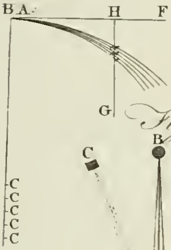
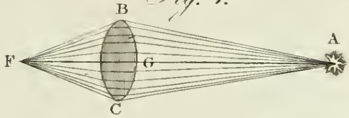


Fig. 1.



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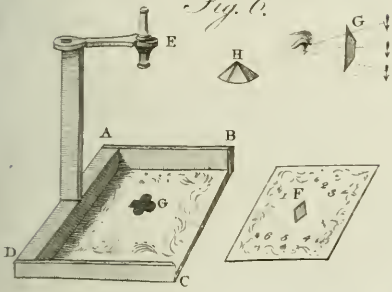

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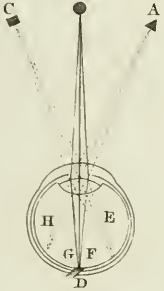

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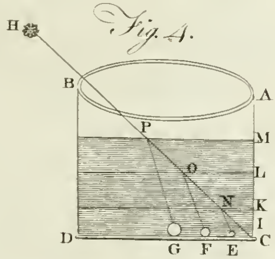

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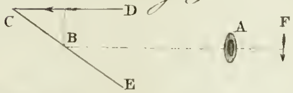

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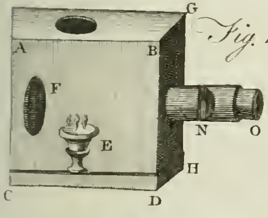

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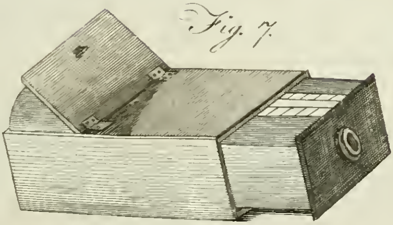

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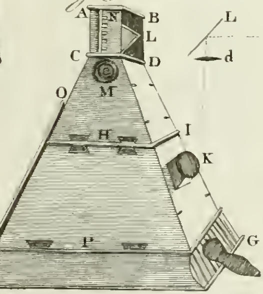

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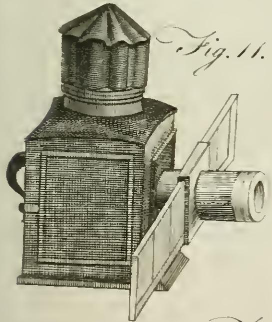

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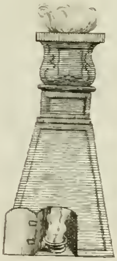

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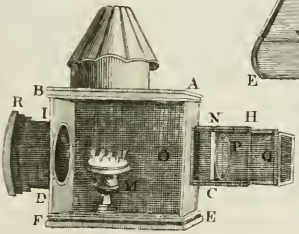

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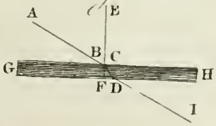

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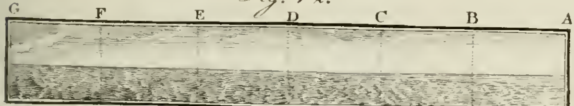

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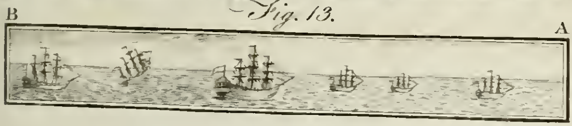

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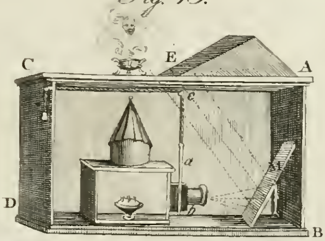

A. Bell Prin. Wall. Sculptor fecit.

Dionyſius, Diophantine.

Oxford, in 1704, in Greek and Latin, by Dr Hudſon.

Dionysius, a learned geographer, to whom is attributed a Periegeſis, or Survey of the Earth, in Greek verſe. Some ſuppoſe that he lived in the time of Auguſtus; but Scaliger and Saumaſius place him under the reign of Severus, or Marcus Aurelius. He wrote many other works, but his Periegeſis is the only one we have remaining; the beſt and moſt uſeful edition of which is that improved with notes and illuſtrations by Hill.

Dionysius (Areopagita), was born at Athens, and educated there. He went afterwards to Heliopolis in Epypt; where, if we may believe ſome writers of his life, he ſaw that wonderful eclipſe which happened at our Saviour's paſſion, and was urged by ſome extraordinary impulſe to cry out, *Aut Deus patitur, aut cum patiente dolet*; "either God himſelf ſuffers, or condoles with him who does." At his return to Athens he was elected into the court of Areopagus, from whence he derived his name of *Areopagite*. About the year 50 he embraced Chriſtianity; and, as ſome ſay, was appointed firſt biſhop of Athens by St Paul. Of his converſion we have an account in the 17th chapter of the Acts of the Apoſtles.—He is ſuppoſed to have ſuffered martyrdom; but whether under Domitian, Trajan, or Adrian, is not certain. We have nothing remaining under his name, but what there is the greateſt reaſon to believe ſpurious.

Dionysius (the Leſſer), a Scythian, became abbot of a monaſtery at Rome: he was the firſt who computed time from the birth of Dionyſius to Chriſt, and fixed that great event, according to the vulgar æra. He was alſo a learned canon-law writer, and died about the year 540.

DIOPHANTINE problems, in mathematics, certain queſtions relating to ſquare and cube numbers, and right-angled triangles, &c. the nature of which was determined by Diophantus, a mathematician of Alexandria, who is believed to have lived about the third century. We have his works, which were publiſhed with notes at Paris, in 1621, by Bachet de Meziriac; and another edition in 1670, with obſervations on every queſtion, by M. Fermat.

Diophantine.

In theſe queſtions it is endeavoured to find commenſurable numbers to anſwer indeterminate problems; which bring out an infinite number of incommenſurable quantities. For example, it is propoſed to find a right-angled triangle, whoſe ſides $x, y, z$, are expreſſed by commenſurable numbers; it is known that $x^2+y^2=z^2$, $z$ being the ſuppoſed hypothenuſe. But it is poſſible to aſſume $x$ and $y$ ſo, that $z$ will be incommenſurable; for if $x=1$, and $y=2$, $z=\sqrt{5}$.

The art of reſolving ſuch problems conſiſts in ſo managing the unknown quantity or quantities in ſuch a manner, that the ſquare or higher power may vaniſh out of the equation, and then by means of the unknown quantity in its firſt dimenſion, the equation may be reſolved without having recourſe to incommenſurables; *e. gr.* let it be ſuppoſed to find $x, y, z$, the ſides of a right-angled triangle, ſuch as will give $x^2+y^2=z^2$. Suppoſe $z=x+u$, then $x^2+y^2=x^2+2xu+u^2$; out of which equation $x^2$ vaniſhes, and $x=\frac{y^2-u^2}{2u}$: then aſſuming $y$ and $u$ equal to any numbers at pleaſure, the ſides of the triangle will be $y, \frac{y^2-u^2}{2u}$, and the hypothenuſe $x+u=\frac{y^2+u^2}{2u}$; if $y=3$, and $u=1$, then $\frac{y^2-u^2}{2u}=4$, and $x+u=5$. It is evident that this problem admits of an infinite number of ſolutions.

For the reſolution of ſuch kind of problems, ſee Saunderſon's Algebra, vol. ii. book 6.

# DIOPTRICS,

THAT part of Optics which treats of the laws of refraction, and the effects which the refraction of light has in viſion. The word is originally Greek, formed of δια *per*, "through," and οπτομαι *I ſee*.

As this and the other branches of Optics are fully treated under the collective name, we ſhall here, 1. Juſt give a ſummary of the general principles of the branch, in a few plain aphoriſms, with ſome preliminary definitions; and, 2. Preſent our readers with a ſet of entertaining experiments illuſtrative of, or dependent upon, thoſe principles.

## DEFINITIONS.

Plate CLXII. fig. 1.

1. When a ray of light paſſing out of one medium into another of a different denſity, is turned from that ſtraight line in which it would otherwiſe proceed into one of a different direction, it is ſaid to be refracted. Thus the rays AB, AC, &c by paſſing out of air into the glaſs BGC, are turned from their natural courſe into that of BF, CF, &c. and are therefore ſaid to be refracted by the lens BGC.

2. Any ſpherical tranſparent glaſs, that converges or diverges the rays of light as they paſs through it, is called a *lens*.

3. Of lenſes there are five ſorts: 1. A plane or ſingle convex lens, which is plane on one ſide and convex on the other; as AZ, fig. 3. 2. A double convex lens, as B. 3. A plano-concave lens, that is, plane on one ſide and concave on the other, as C. 4. A double concave, as D. And, 5. A meniſcus, which is convex on one ſide and concave on the other, as E.

Fig. 2.

4. The point C, round which the ſpherical ſurface of a lens, as AZ, is deſcribed, is called its *centre*; the line XY, drawn from that centre perpendicular to its two ſurfaces, is the axis; and the point V, to which the axis is drawn, is the vertex of that lens.

5. When the rays of light that paſs through a ſingle or double convex lens are brought into their ſmalleſt compaſs, that point is the focus of the lens.

6. In optical inſtruments, that lens which is next the object is called the *object-glaſs*; and that next the eye, the *eye-glaſs*.

Fig. 3.

7. The diſtance between the line AB and the perpendicular EF, is called the *angle of incidence*; and the diſtance between the line BD and the perpendicular EF, is called the *angle of refraction*.

APHO-

## APHORISMS.

Plate CLXII. Fig. 3. 1. A ray of light paſſing obliquely out of one medium into another that is denſer, will be refracted toward the perpendicular; as the ray AB, by paſſing out of air into glaſs, is refracted into BF, inclined to the perpendicular AF. On the contrary, a ray paſſing out of a denſer into a rarer medium, will be refracted from the perpendicular; as the ray BC, paſſing out of the glaſs GH into air, is refracted into DI.

2. The ſines of the angles of incidence and refraction, when the lines that contain them are all equal, will have a determinate proportion to each other, in the ſame mediums: which between air and water will be as 4 to 3; between air and glaſs, as 3 to 2, nearly; and in other mediums in proportion to their denſities.

3. Any object viewed through a glaſs, whoſe two ſurfaces are parallel, will appear of its natural ſhape and dimenſions, provided it be only of the ſize of the pupil of the eye, and the light proceeding from it be received directly through the glaſs by one eye only. In all other ſituations an alteration will be perceived not only in its apparent ſituation, but its dimenſions alſo. This alteration will be greater in proportion to the thickneſs of the glaſs, and the obliquity of the rays; in general, it is ſo ſmall as to be overlooked.

4. All the rays of light which fall upon a convex lens, whether parallel, converging, or diverging to a certain degree, will be made to meet in a focus on the other ſide; but if they diverge exceſſively, they will not do ſo. Thus if rays diverge from a point placed before the glaſs, at the focal diſtance from it, they will become parallel after paſſing through it; and if the point from which they proceed be nearer the glaſs than its focal diſtance, they will ſtill continue to diverge, though in a leſs degree than before.

5. When parallel rays fall upon a concave lens, they will be made to diverge after paſſing through it. If they are diverging already before they fall upon the glaſs, they will diverge more after paſſing through it; or even if they are converging to a certain degree, they will diverge upon paſſing through a concave lens; but if the convergence is very great, they will converge after paſſing through the glaſs, though to a more diſtant point than that at which they would otherwiſe have met.

6. When an object is viewed through two convex lenſes, its apparent diameter ought to be to its real one as the diſtance of the focus of the object-glaſs is to that of the eye-glaſs; but by reaſon of the aberration of the rays of light, the magnifying power will be ſomewhat greater or leſs in proportion to the diameter of the object.

By theſe aphoriſms we are enabled to account for the various effects of dioptric machines, as refracting teleſcopes, microſcopes, the camera obſcura, &c. See OPTICS.

## ENTERTAINING EXPERIMENTS.

### I. *Optical illuſions.*

Fig. 4. On the bottom of the veſſel ABCD, place three pieces of money, as a ſhilling, a half-crown, and a crown; the firſt at E, the ſecond at F, and the laſt at G. Then place a perſon at H, where he can ſee no further into the veſſel than I: and tell him, that by pouring water into the veſſel you will make him ſee three different pieces of money; bidding him obſerve carefully whether any money goes in with the water. Plat CLX

Here you muſt obſerve to pour in the water very gently, or contrive to fix the pieces, that they may not move out of their places by its agitation.

When the water comes up to K, the piece at E will become viſible; when it comes up to L, the pieces at E and F will appear; and when it riſes to M, all the three pieces will be viſible.

From what has been ſaid of the refraction of light, the cauſe of this phenomenon will be evident: for while the veſſel is empty, the ray HI will naturally proceed in a ſtraight line: but in proportion as it becomes immerſed in water, it will be neceſſarily refracted into the ſeveral directions NE, OF, PG, and conſequently the ſeveral pieces muſt become viſible.

### II. *Optical Augmentation.*

Take a large drinking glaſs of a conical figure, that is ſmall at bottom and wide at top; in which put a ſhilling, and fill the glaſs about half full with water: then place a plate on the top of it, and turn it quickly over, that the water may not get out. You will then ſee on the plate, a piece of the ſize of a half crown; and ſomewhat higher up, another piece of the ſize of a ſhilling.

This phenomenon ariſes from ſeeing the piece thro' the conical ſurface of the water at the ſide of the glaſs, and through the flat ſurface at the top of the water, at the ſame time: for the conical ſurface dilates the rays, and makes the piece appear larger; but by the flat ſurface the rays are only refracted, by which the piece is ſeen higher up in the glaſs, but ſtill of its natural ſize. That this is the cauſe will be further evident by filling the glaſs with water; for as the ſhilling cannot be then ſeen from the top, the large piece only will be viſible.

### III. *Optical Subtraction.*

AGAINST the wainſcot of a room fix three ſmall pieces of paper, as A, B, C, at the height of your eye; Fig. 5. and placing yourſelf directly before them, ſhut your right eye and look at them with the left; when you will ſee only two of thoſe papers, ſuppoſe A and B; but altering the poſition of your eye, you will then ſee the third and one of the firſt, ſuppoſe A; and by altering your poſition a ſecond time, you will ſee B and C; but never all three of them together.

The cauſe of this phenomenon is, that one of the three pencils of rays that come from theſe objects, falls conſtantly on the optic nerve at D; whereas to produce diſtinct viſion, it is neceſſary that the rays of light fall on ſome part of the retina E, F, G, H. We ſee by this experiment, one of the uſes of having two eyes; for he that has one only, can never ſee three objects placed in this poſition, nor all the parts of one object of the ſame extent, without altering the ſituation of his eye.

### IV. *Alternate Illuſion.*

WITH a convex lens of about an inch focus, look atten-

Plate LXII. attentively at a ſilver ſeal, on which a cipher is engraved. It will at firſt appear cut in, as to the naked eye; but if you continue to obſerve it ſome time, without changing your ſituation, it will ſeem to be in relief, and the lights and ſhades will appear the ſame as they did before. If you regard it with the ſame attention ſtill longer, it will again appear to be engraved: and ſo on alternately.

If you look off the ſeal for a few moments, when you view it again, inſtead of ſeeing it, as at firſt, engraved, it will appear in relief. If, while you are turned toward the light, you ſuddenly incline the ſeal, while you continue to regard it, thoſe parts that ſeemed to be engraved will immediately appear in relief: and if, when you are regarding theſe ſeeming prominent parts, you turn yourſelf ſo that the light may fall on the right hand, you will ſee the ſhadows on the ſame ſide from whence the light comes, which will appear not a little extraordinary. In like manner the ſhadows will appear on the left, if the light fall on that ſide. If, inſtead of a ſeal, you look at a piece of money, theſe alterations will not be viſible, in whatever ſituation you place yourſelf.

It has been ſuſpected that this illuſion ariſes from the ſituation of the light: and in fact, "I have obſerved (ſays M. Guyot, from whom this article is taken), that when I have viewed it with a candle on the right, it has appeared engraved; but by changing the light to the left ſide, it has immediately appeared in relief." It ſtill, however, remains to be explained, why we ſee it alternately hollow and prominent, without changing either the ſituation or the light. Perhaps it is in the ſight itſelf that we muſt look for the cauſe of this phenomenon; and this ſeems the more probable, as all theſe appearances are not diſcernible by all perſons.

Mr William Jones of Holborn, has remarked to us, that this illuſion is ſtill more extraordinary and permanent, when you look at a cavity in a ſeal or other object through the three eye-glaſſes of a common four glaſs refracting teleſcope: all cavities viewed thro' theſe glaſſes appear conſtantly reliefs, in almoſt all ſituations of the light you ſee them with.

### V. *The Dioptrical Paradox.*

A NEW and curious optical, or what may be called properly a *dioptrical*, deception, has been made by Mr W. Jones. Its effect is, that a print, or an ornamented drawing, with any object, ſuch as an *ace of diamonds*, &c. in the centre F, will be ſeen as the *ace of clubs* when it is placed in the machine ABDC, and viewed 6. through a ſingle glaſs only contained in the tube E. The conſtruction of this machine is truly ſimple. The glaſs in the tube F, which brings about this ſurpriſing change, is ſomewhat on the principle of the common multiplying glaſs, as repreſented at G, which by the number of its inclined ſurfaces, and from the refractive power of the rays proceeding from the objects placed before it, ſhows it in a multiplied ſtate or quantity. Its only difference is, that the ſides of this glaſs are flat, and diverge upwards from the baſe to a point in the axis of the glaſs like a cone: the number of the ſides is ſix; and each ſide, from its angular poſition to the eye, has the property of refracting from the border of the print F ſuch a portion of it (deſignedly there placed), as will make a part in the compoſition of the figure to be repreſented: for the hexagonal and conical figure of this glaſs prevents any ſight of the ace of diamonds in the centre being ſeen; conſequently the ace of clubs being previouſly and mechanically drawn in the circle of refraction in ſix different parts of the border, at 1, 2, 3, 4, 5, 6, and artfully diſguiſed in the ornamental border by blending them with it, the glaſs in the tube at E will change the appearance of the ace of diamonds F into the ace of clubs G. In the ſame manner may other prints undergo ſimilar changes, according to the will of an ingenious draughtſman who may deſign them. The figure of the glaſs is clearly ſhown at H. Plate CLXII.

### VI. *The Camera Obſcura, or Dark Chamber.*

MAKE a circular hole in the ſhutter of a window, from whence there is a proſpect of the fields, or any other object not too near; and in this hole place a convex glaſs, either double or ſingle, whoſe focus is at the diſtance of five or ſix feet (A). Take care that no light enter the room but by this glaſs: at a diſtance from it, equal to that of its focus, place a paſteboard, covered with the whiteſt paper; which ſhould have a black border, to prevent any of the ſide rays from diſturbing the picture. Let it be two feet and a half long, and 18 or 20 inches high: bend the length of it inwards, to the form of part of a circle, whoſe diameter is equal to double the focal diſtance of the glaſs. Then fix it on a frame of the ſame figure, and put it on a moveable foot, that it may be eaſily fixed at that exact diſtance from the glaſs where the objects paint themſelves to the greateſt perfection. When it is thus placed, all the objects that are in the front of the window will be painted on the paper, in an inverted poſition (B), with the greateſt regularity and in the moſt natural colours.

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(A) The diſtance ſhould not be leſs than three feet; for if it be, the images will be too ſmall, and there will not be ſufficient room for the ſpectators to ſtand conveniently. On the other hand, the focus ſhould never be more than 15 or 20 feet, for then the images will be obſcure, and the colouring faint. The beſt diſtance is from 6 to 12 feet.

(B) This inverted poſition of the images may be deemed an imperfection, but it is eaſily remedied: for if you ſtand above the board on which they are received, and look down on it, they will appear in their natural poſition: or if you ſtand before it, and, placing a common mirror againſt your breaſt in an oblique direction, look down in it, you will there ſee the images erect, and they will receive an additional luſtre from the reflection of the glaſs; or place two lenſes, in a tube that draws out; or, laſtly, if you place a large concave mirror at a proper diſtance before the picture, it will appear before the mirror, in the air, and in an erect poſition.

If you place a moveable mirror without the window; by turning it more or leſs, you will have on the paper all the objects that are on each ſide of the window (c).

If inſtead of placing the mirror without the window you place it in the room, and above the hole (which muſt then be made near the top of the ſhutter), you may receive the repreſentation on a paper placed horizontally on a table; and draw, at your leiſure, all the objects that are there painted.

Nothing can be more pleaſing than this experiment, eſpecially when the objects are ſtrongly enlightened by the ſun: and not only land-proſpects, but a ſea-port, when the water is ſomewhat agitated, or at the ſetting of the ſun, preſents a very delightful appearance.

This repreſentation affords the moſt perfect model for painters, as well for the tone of colours, as that degradation of ſhades, occaſioned by the interpoſition of the air, which has been ſo juſtly expreſſed by ſome modern painters.

It is neceſſary that the paper have a circular form; for otherwiſe, when the centre of it was in the focus of the glaſs, the two ſides would be beyond it, and conſequently the images would be confuſed. If the frame were contrived of a ſpherical figure, and the glaſs were in its centre, the repreſentation would be ſtill more accurate. If the object without be at the diſtance of twice the focal length of the glaſs, the image in the room will be of the ſame magnitude with the object.

The lights, ſhades, and colours, in the camera obſcura, appear not only juſt, but, by the images being reduced to a ſmaller compaſs, much ſtronger than in nature. Add to this, that theſe pictures exceed all others, by repreſenting the motion of the ſeveral objects: thus we ſee the animals walk, run, or fly; the clouds float in the air; the leaves quiver; the waves roll, &c.; and all in ſtrict conformity to the laws of nature. The beſt ſituation for a dark chamber is directly north, and the beſt time of the day is noon.

### VII. *To ſhow the Spots on the Sun's Diſk, by its Image in the Camera Obſcura.*

Put the object glaſs of a 10 or 12 feet teleſcope into the ſcioptric ball, and turn it about till it be directly oppoſite to the ſun (d). Then place the paſteboard, mentioned in the laſt experiment, in the focus of the lens; and you will ſee a clear bright image of the ſun, of about an inch diameter, in which the ſpots on the ſun's ſurface will be exactly deſcribed.

As this image is too bright to be ſeen with pleaſure by the naked eye, you may view it through a lens whoſe focus is at ſix or eight inches diſtance; which at the ſame time that it prevents the light from being offenſive, will, by magnifying both the image and the ſpots, make them appear to greater advantage.

### VIII. *To magnify ſmall Objects by means of the Sun's Rays let into a Dark Chamber.*

Let the rays of light that paſs through the lens in the ſhutter be thrown on a large concave mirror, properly fixed in a frame. Then take a ſlip or thin plate of glaſs; and ſticking any ſmall object on it, hold it in the incident rays, at a little more than the focal diſtance from the mirror; and you will ſee, on the oppoſite wall, amidſt the reflected rays, the image of that object, very large, and extremely clear and bright. This experiment never fails to give the ſpectator the higheſt ſatisfaction.

### IX. *The Portable Camera Obſcura.*

The great pleaſure produced by the camera obſcura in the common form, has excited ſeveral to render it more univerſally uſeful by making it portable; eaſily fixed on any ſpot, and adapted to every proſpect. We ſhall not here examine the merits of the various ſorts that have been invented; but content ourſelves with deſcribing two of late improved conſtructions, as made and ſold by the opticians of the preſent time, and that appear in their conſtruction the moſt convenient and advantageous of any yet contrived.

Fig. 7.

The pocket or portable camera obſcura, with a drawer to draw out in the front, is repreſented in fig. 7. The images of the objects before the inſtrument are reflected upon a glaſs ground rough on its upper ſide, and that is placed at top of the hinder part of the box, under the moveable cover repreſented in the figure. The images repreſented thereon will afford a moſt beautiful and perfect piece of perſpective or landſcape of whatever is before the camera, and more particularly ſo if the ſun ſhines upon the objects. The outlines of them may eaſily be traced on the glaſs by a black-lead pencil. There is ſometimes a ſcale of proportions placed in the upper ſurface of the drawer, by which any particular building or other object may be drawn in a given proportion or magnitude, and according to the figures inſerted on the ſcale, which are adapted to the focus or foci of the lenſes made uſe of in the camera. The glaſſes that are made uſe of in this camera are only three, and are repreſented in fig. 8. The convex glaſs A is placed in the front of the drawer of the camera, and is of a focus agreeable to the length of the box. The mirror CE reclines in the box in an angle of 45 degrees from a perpendicular ſituation. The rays flowing from the object F through the convex glaſs A to the plane mirror CE, will be reflected from it, and meet in points on the glaſs placed horizontally

Fig. 8

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(c) There is another method of making the dark chamber; which is by a ſcioptric ball, that is, a ball of wood, through which a hole is made, in which hole a lens is fixed: this ball is placed in a wooden frame, in which it turns freely round. The frame is fixed to the hole in the ſhutter; and the ball, by turning about, anſwers, in great part, the uſe of the mirror on the outſide of the window. If the hole in the window be no bigger than a pea, the objects will be repreſented without any lens, though by no means ſo diſtinctly, or with ſuch vivid colours.

(d) When the ſun is directly oppoſite to the hole, the lens will itſelf be ſufficient: or by means of the mirror on the outſide of the window, as in Experiment VI. the lens will anſwer the purpoſe at any time.

Plate CLXII. zontally in the direction CD, and will form thereon the aforementioned images. If on this glaſs an oiled paper or any other tranſparent ſubſtance be placed, the images will be clearly repreſented, and ſufficiently ſo to delineate them by a black-lead pencil or crayon. Inſtead of the glaſs CD, or ſometimes underneath it, is often placed a double convex lens of a focus ſomewhat ſhorter than the length of the box : this alteration conſiderably brightens the appearance of the images, and renders them as vivid as the objects themſelves, though not quite ſo accurate in their contours or outlines as by the preceding method.

Fig. 9. Another kind of portable camera obſcura is, where the images are formed upon white paper, and the ſeveral parts of the camera fold up out of a box ſhaped like a book or cheſt. This way of the images being formed on paper is a much preferable one to the preceding method, and admits of their being traced on the paper with the utmoſt readineſs. This inſtrument, as open out of its caſe and ready for uſe, is repreſented in fig. 9. The front and ſides fold up to the height of about two feet from the caſe EFG, by means of hinges placed at P, H, &c. The head ABCD, about five inches ſquare and high, containing the mirror L and the convex lens beneath it, fits on at CD, and the inner ſquare tube of it is moved up and down by rack-work and a pinion NM. This motion ſerves to adjuſt the convex lens *d* to its proper focal diſtance from the white paper placed within ſide at the bottom of the box EFG, ſo that the images may be formed with the greateſt poſſible diſtinctneſs. In tracing theſe images the face is applied cloſe to the hole in the front at K, and the hand in the ſleeve in the front at the bottom of FG. When the ſides and front are unhooked and folded down, they all lie cloſe in the box EFG, and the lid O folds down as a top on them cloſe, and the box remains then the ſize of a common folio book, and is covered with calf leather and lettered on the back in perfect imitation of one.

By the diagonal poſition of a plane mirror the curious opera-glaſs is conſtructed, by which any perſon may be viewed in a theatre or public company, and yet know nothing of it. It conſiſts only in placing a concave glaſs near the plane mirror, in the end of a ſhort round tube, and a convex glaſs in a hole in the ſide of the tube. Then holding the end of the tube with the glaſs to the eye, all objects next to the hole in the ſide will be reflected ſo as to appear in a direct line forward, or in a poſition at right angles to the perſon's ſituation who is looked at. Plane glaſſes inſtead of a concave and convex may be uſed : but in this caſe there will be no magnitude of the object, but it will appear brighter. It is called by opticians the *diagonal opera-glaſs*.

### X. *The Magic Lantern.*

THIS very remarkable machine, which is now known over all the world, cauſed great aſtoniſhment at its origin. It is ſtill beheld with pleaſing admiration ; and the ſpectator very frequently contents himſelf with wondering at its effects, without endeavouring to inveſtigate their cauſe. The invention of this ingenious illuſion is attributed to the celebrated P. Kercher, who has publiſhed on various ſciences, works equally learned, curious, and entertaining. Its deſign is to repreſent at large, on a cloth or board, placed in the dark, the images of ſmall objects, painted with tranſparent colours on plates of glaſs.

Plate CLXII. Fig. 10. The conſtruction is as follows. Let ABCD be the ſide of a tin box, eight inches high, eight inches long, and ten broad (or any other ſimilar dimenſions), the top of which muſt have a funnel, with a cover, as repreſented in fig. 11 ; which at the ſame time it gives a paſſage to the ſmoke, prevents the light from coming out of the box. In the middle of the bottom of the box muſt be placed a low tin lamp E, which is to be moveable. It ſhould have three or four lights, that muſt be at the height of the centre of the glaſſes in the tubes N and O. In the largeſt of theſe tubes muſt be placed a glaſs ſemiglobular lens N, about four inches diameter ; and in the ſmaller one a double convex lens o, about $2\frac{1}{2}$ inches diameter, and ſix inches focus, the length of the tubes holding them about $4\frac{1}{2}$ inches each : the inner tube containing the ſmall lens o muſt be a ſliding one, in order to adjuſt it at a proper diſtance from the painted ſliders, ſo that the objects thereon may be diſtinctly repreſented on the cloth or white wall. A ſlit or opening between the glaſs N and the front ſide BGDH of the box muſt be made large enough to admit the ſliders to be paſſed through, (as in fig. 11.) The clearneſs of the light, and the objects upon the cloth, will depend much upon the light of the lamp : it will therefore be proved beſt, to place, inſtead of the common lamp E, a kind of the new or Argant's Patent Lamp, which will be found conſiderably to improve the effect of the lantern by its ſuperior ſtrength of light.

From the conſtruction of this lantern it is evident, that when the glaſs ſliders, with the painted figures, are placed in the groove or ſlit in the lantern for that purpoſe, and the room darkened, a quantity of light from the lamp at E will be collected by the lens N, and refracted upon the cloth placed oppoſite ; and that by moving the ſliding tube containing the ſmall lens o gradually in or out as occaſion may require, this lens will form images of the figures on the ſliders in their diſtinct colours and proportions, with the appearance of life itſelf, and of any ſize from ſix inches to 7 feet, according to the diſtance of the lantern from the cloth. The lantern, with one of the ſliders ready for uſe, is clearly repreſented in fig. 11. By the aid of the new patent lamp aforementioned, conſiderable uſeful improvements are made to this lantern. Mr Jones optician of Holborn has contrived an apparatus to be applied to it, that converts it into a microſcope by night ; and it ſhows all the variety of tranſparent and many of the opaque objects magnified upon a cloth or ſkreen oppoſite, ſimilar to the figures above mentioned, but not in ſo large a degree ; about one or two feet diameter is the utmoſt that can at preſent be obtained.

*Method of Painting the Glaſſes for the Lantern.* Draw on a paper the ſubject you deſire to paint, and fix it at each end to the glaſs. Provide a varniſh with which you have mixed ſome black paint; and with a fine pencil draw on the other ſide of the glaſs, with very light touches, the deſign drawn on the paper. If you are deſirous of making the painting as perfect as poſſible, you ſhould draw ſome of the outlines in their

proper

Plate CLXII.

proper colours, provided they are the ſtrongeſt tints of theſe colours that are uſed. When the outlines are dry, you colour the figures with their proper tints or degradations. Tranſparent colours are moſt proper for this purpoſe, ſuch as carmine, lake, Pruſſian blue, verdigris, &c. and theſe muſt be tempered with a ſtrong white varniſh, to prevent their peeling off. You are then to ſhade them with black mixed with the ſame varniſh, or with biſtre, as you find convenient. You may alſo leave ſtrong lights in ſome parts, without any colours, in order to produce a more ſtriking effect. Obſerve, in particular, not to uſe more than four or five colours, ſuch as blue, red, green, and yellow. You ſhould employ, however, a great variety of tints, to give your painting a more natural air; without which they will repreſent vulgar objects, which are by no means the more pleaſing becauſe they are gawdy.

When the lamp in this lantern is lighted, and, by drawing out the tube to a proper length, the figures painted on the glaſs appear bright and well defined, the ſpectator cannot fail of being highly entertained by the ſucceſſion of natural or groteſque figures that are painted on the glaſſes. This piece of optics may be rendered much more amuſing, and at the ſame time more marvellous, by preparing figures to which different natural motions may be given (E), which every one may perform according to his own taſte; either by movements in the figures themſelves, or by painting the ſubject on two glaſſes, and paſſing them at the ſame time through the groove, as will be ſeen in the next experiment.

### XI. *To repreſent a Tempeſt by the Magic Lantern.*

Provide two plates of glaſs, whoſe frames are ſo thin that they may both paſs freely through the ſlit or groove of the common magic lanterns at the ſame time.

Fig. 12. On one of theſe glaſſes you are to paint the appearance of the ſea, from the ſlighteſt agitation to the moſt violent commotion. Repreſenting from A to B a calm; from B to C a ſmall agitation, with ſome clouds; and ſo on to F and G, which ſhould exhibit a furious ſtorm. Obſerve, that theſe repreſentations are not to be diſtinct, but run into each other, that they may form a natural gradation: remember alſo, that great part of the effect depends on the perfection of the painting, and the pictureſque appearance of the deſign.

Fig. 13. On the other glaſs you are to paint veſſels of different forms and dimenſions, and in different directions, together with the appearance of clouds in the tempeſtuous parts.

You are then to paſs the glaſs ſlowly through the groove; and when you come to that part where the ſtorm begins, you are to move the glaſs gently up and down, which will give it the appearance of a ſea that begins to be agitated: and ſo increaſe the motion till you come to the height of the ſtorm. At the ſame time you are to introduce the other glaſs with the ſhips, and moving that in like manner, you will have a natural repreſentation of the ſea, and of ſhips in a calm and in a ſtorm. As you draw the glaſſes ſlowly back, the tempeſt will ſeem to ſubſide, the ſky grow clear, and the ſhips glide gently over the waves.—By means of two glaſſes diſpoſed in this manner you may likewiſe repreſent a battle, or ſea-fight, and numberleſs other ſubjects, that every one will contrive according to his own taſte. They may alſo be made to repreſent ſome remarkable or ludicrous action between different perſons, and many other amuſements that a lively imagination will eaſily ſuggeſt.

Plate CLXII.

### XII. *The Nebulous Magic Lantern.*

The light of the magic lantern, and the colour of images, may not only be painted on a cloth, but alſo reflected by a cloud of ſmoke.

Provide a box of wood or paſteboard (fig. 14.) of about four feet high, and of ſeven or eight inches ſquare at bottom, but diminiſhing as it aſcends, ſo that its aperture at top is but ſix inches long, and half an inch wide. At the bottom of this box there muſt be a door that ſhuts quite cloſe, by which you are to place in the box a chafing-diſh with hot coals, on which is to be thrown incenſe, whoſe ſmoke goes out in a cloud at the top of the box. It is on this cloud that you are to throw the light that comes out of the lantern, and which you bring into a ſmaller compaſs by drawing out the moveable tube. The common figures will here ſerve. It is remarkable in this repreſentation, that the motion of the ſmoke does not at all change the figures; which appear ſo conſpicuous, that the ſpectator thinks he can graſp them with his hand. Fig. 14.

*Note*, In this experiment ſome of the rays paſſing through the ſmoke, the repreſentation will be much leſs vivid than on the cloth; and if care be not taken to reduce the light to its ſmalleſt focus, it will be ſtill more imperfect.

### XIII. *To produce the Appearance of a Phantom upon a Pedeſtal placed on the middle of a Table.*

Incloſe a common ſmall magic lantern in a box A B C D, that is large enough to contain alſo an inclined mirror M; which muſt be moveable, that it may reflect the cone of light thrown on it by the lantern, in ſuch a manner that it may paſs out at the aperture made in the top of the box. There ſhould be a flap with hinges to cover the opening, that the inſide of the box may not be ſeen when the experiment is making. This aperture ſhould likewiſe be oval, and of a ſize adapted to the cone of light that is to paſs thro' it. There muſt be holes made in that part of the box which is over the lantern, to let out the ſmoke; and over that part muſt be placed a chafing-diſh of an oblong figure, and large enough to hold ſeveral lighted coals. This chafing-diſh may be incloſed in a painted tin box of about a foot high, and with an aperture at top ſomething like fig. 14. It ſhould ſtand on four ſhort feet, to give room for the ſmoke of the lamp to paſs out. There muſt alſo be a glaſs that will aſcend and deſcend at pleaſure in a vertical groove *ab*. To this glaſs let there be fixed a cord, that, going over a pulley Fig. 15.

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(E) There are in the Philoſophical Eſſays of M. Muſchenbroek, different methods of performing all theſe various movements, by ſome mechanical contrivances that are not difficult to execute.

Plate LXII. Plat CLXII.

ley *c*, paſſes out of the box at the ſide CD, by which the glaſs may be drawn up, and will deſcend by its own weight. On this glaſs may be painted a ſpectre, or any other more pleaſing figure. Obſerve that the figures muſt be contracted in drawing, as the cloud of ſmoke does not cut the cone of light at right angles, and therefore the figures will appear longer than they do on the glaſs.

After you have lighted the lamp in the lantern, and put the miror in a proper direction, you place the box or pedeſtal ABCD on a table; and putting the chafing-diſh in it, throw ſome incenſe in powder on the coals. You then open a trap-door, and let down the glaſs ſlowly; and when you perceive the ſmoke diminiſh you draw up the glaſs, that the figure may diſappear, and ſhut the trap-door. This appearance will occaſion no ſmall ſurpriſe, as the ſpectre will ſeem to riſe gradually out of the pedeſtal, and on drawing up the glaſs will diſappear in an inſtant. Obſerve, that when you exhibit this experiment, you muſt put out all the lights in the room; and the box ſhould be placed on a high table, that the ſpectators may not perceive the aperture by which the light comes out. Tho' we have mentioned a ſmall magic lantern, yet the whole apparatus may be ſo enlarged, that the phantom may appear of a formidable ſize.

### XIV. *The Magic Theatre.*

By making ſome few additions to the magic lantern with the ſquare tube, uſed in Experiment X. various ſcenes, characters, and decorations of a theatre may be repreſented in a lively manner. In this experiment it is quite neceſſary to make the lantern much larger than common, that the objects painted on the glaſſes, being of a larger ſize, may be repreſented with greater preciſion, and conſequently their ſeveral characters more ſtrongly marked.

16. Let there be made a wooden box ABCD, a foot and a half long, 15 inches high, and 10 wide. Let it be placed on a ſtand EF, that muſt go round it, and by which it may be fixed with two ſcrews to a table. Place over it a tin cover, as in the common lantern. Make an opening in its two narroweſt ſides; in one of which place the tube H, and in the other the tube I: let each of them be ſix inches wide, and five inches high: in each of theſe tubes place another that is moveable, in order to bring the glaſſes, or concave mirror, that are contained in them, to a proper diſtance. In the middle of the bottom of this box place a tin lamp M; which muſt be moveable in a groove, that it may be placed at a proper diſtance with regard to the glaſſes and mirror: this lamp ſhould have five or ſix lights, each of them about an inch long. At the beginning of the tube H, toward the part N, make an opening of an inch wide, which muſt croſs it laterally: another of three quarters of an inch, that muſt croſs it vertically, and be nearer the box than the firſt; and a third of half an inch, that muſt be before the firſt. The opening made laterally muſt have three or four grooves, the ſecond two, and the third one: that different ſubjects of figures and decorations may be paſſed, either ſidewiſe, aſcending or deſcending, ſo that the ſcenes of a theatre may be the more exactly imitated (F). Incloſe theſe grooves between two convex rectangular glaſſes, of ſix inches long, and five inches high, and of about 20 inches focus; one of which muſt be placed at O, and the other toward P. Have another tube Q, of about a foot long, which muſt enter that marked H; and at its outward extremity place a lens of about 15 inches focus. There muſt alſo be a third tube R, four inches long, into which that marked I is to enter: to the exterior end of this adjuſt a concave mirror, whoſe focus muſt be at ſeven or eight inches from its reflecting ſurface.

The magic lantern being thus adjuſted, nothing more is neceſſary than to provide glaſſes, painted with ſuch ſubjects as you would repreſent, according to the grooves they are to enter. The lamp is then to be lighted; and placing a glaſs in one of the grooves, you draw out the moveable tubes till the object paints itſelf on a cloth to the moſt advantage: by which you determine the diſtance of the lantern and the ſize of the image. You then make a hole in the partition of that ſize, and fix in it a plate of clear glaſs, over which you paſte a very thin paper, which muſt be varniſhed, that it may be as tranſparent as poſſible.

On this paper are to be exhibited the images of all thoſe objects, that, by paſſing ſucceſſively through the grooves, are to repreſent a theatric entertainment. The exhibition will be very agreeable; becauſe the magic lantern being concealed behind the partition, the cauſe of the illuſion cannot by any means be diſcovered.

In order to ſhow more clearly in what manner a ſubject of this ſort ſhould be painted, and the glaſſes diſpoſed, we will here make choice of the ſiege of Troy for a theatric ſubject; in which will be found all the incidents neceſſary to the exhibition of any other ſubject whatever.—In the firſt act, the theatre may repreſent, on one ſide, the ramparts of Troy; toward the back-part, the Grecian camp; and at a further diſtance, the ſea, and the iſle of Tenedos. We will ſuppoſe the time to be that when the Greeks feigned to raiſe the ſiege; and embarked, leaving behind them the wooden horſe, in which were contained the Grecian ſoldiers.—On a glaſs, therefore, of the ſame width with the aperture made in the ſide AC of the box, you are to paint a deep blue curtain, lightly charged with ornaments, quite tranſparent. This glaſs is to be placed in the firſt vertical groove; ſo that by letting it gently down, its image may appear to riſe in the ſame manner as the curtain of a theatre. All the glaſſes that are to aſcend or deſcend muſt be bordered with thin pieces of wood, and ſo exactly fill the grooves, that they may not ſlide down of themſelves.—You muſt have ſeveral glaſſes of a proper ſize to paſs through the horizontal grooves, and of different lengths according to the extent of the ſubject. You may paint, on the firſt, the walls of Troy. On the ſecond, the Grecian camp. On the third, the ſea, the iſle of Tenedos, and a ſerene ſky. On the fourth, the Grecian troops

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(F) In the decorations, the clouds and the palaces of the gods ſhould deſcend; caves and inferna palaces ſhould aſcend; earthly palaces, gardens, &c. enter at the ſides.

Plate CLXII.

troops by detached figures. On the fifth, other troops, diſpoſed in battalions, and placed at a diſtance. On the ſixth, divers veſſels, which as the glaſs advances in the groove diminiſh in ſize. On the ſeventh, the wooden horſe and Sinon. On the eighth, Trojan men and women.

Theſe glaſſes being properly painted, you place in the horizontal grooves the firſt, ſecond, third, and fourth. Then draw up the curtain, by letting down the glaſs on which it is painted and draw away gently the fourth glaſs, and after that the ſecond; then advance very gently the fifth, that repreſents the embarkment, and paſs it quite through. Next paſs, the oppoſite way, the ſixth, which repreſents the Grecian fleet. The objects painted on the fourth, fifth, and ſixth, quite diſappearing, you are to advance the ſeventh, on which is painted the wooden horſe; and at the ſame time the eighth, where the Trojans will appear to draw the horſe into the city. The curtain is then to be let down, that you may withdraw the ſcenes of the firſt act, and place in the grooves thoſe that are to compoſe the ſecond.—In the ſecond act may be repreſented the interior part of the city of Troy: on one ſide may be ſeen the wooden horſe, and in the back part the temple of Pallas. The glaſſes for this act may be painted in the following manner. On the firſt may be palaces and houſes, repreſenting the inſide of a city. On the ſecond, the temple of Pallas in the centre, with a clear night and the moon. In the front may be ſeen the wooden horſe, that the Trojans have placed near the temple of Pallas. On the third, a troop of Greeks, with Sinon at their head, who are going to open the gates of the city to the Grecians. On the fourth, different troops of armed Greeks; painted on a long glaſs, to afford variety. On the fifth, ſeveral troops of Trojans. On the ſixth, various appearances of fire and ſmoke, ſo diſpoſed, that, this glaſs being drawn up above the others, the objects painted on the firſt glaſs may appear in a conflagration.

Before you draw up the curtain, you ſhould place the firſt and ſecond glaſſes. You then paſs the whole third glaſs ſlowly; a little after, the fourth, on which are painted the different bodies of armed Greeks; and at the ſame time, from the oppoſite ſide, the ſixth glaſs, that repreſents the Trojan troops; obſerving to move them ſlowly both in advancing and retreating, to imitate a combat (c). Then draw up, by degrees, the ſixth, on which are painted the fire, flame, and ſmoke, ſo that the palaces and houſes painted on the firſt glaſs may appear to take fire gradually, and at laſt preſent a general conflagration. After having repreſented theſe incidents with the greateſt attention, you let fall the curtain to prepare for the third act. In this may be repreſented the inſide of Priam's palace; where is ſeen an altar, round which ſeveral Trojan princeſſes appear, who have fled thither for ſafety. On the firſt glaſs may be painted the palace. On the ſecond, a view of the back part of the palace, with the altar. On the third, Priam with ſeveral Trojan men and women. On the fourth, Pyrrhus and a troop of Greeks. On the fifth, the ſame actors, with the palace in flames. On the ſixth, a conflagration.—The two firſt glaſſes which are to be drawn up, ſhould be placed before you raiſe the curtain. Then paſs the third; next advance the fourth; which being drawn up, diſcovers on the fifth the palace in flames; then drawing up the ſixth, let down the firſt, that the palace may appear entirely deſtroyed by the conflagration.

Plate CLXII.

The fourth act may repreſent the environs of Troy, with a diſtant proſpect of the ſea. The firſt and third glaſſes of the firſt act may be here uſed; to which may be added a third, repreſenting Æneas bearing his father Anchiſes, followed by his ſon Iulus and ſome Trojans. With this glaſs may be repreſented the flight of the Trojans and the embarkment of Æneas; with another glaſs, on which are painted certain veſſels.—To this act the following ſcenes may be added: The cave of Æolus; the back part of the cave; Æolus; the winds; Juno in her chariot.

The fifth act ſhould repreſent the open ſea, with the fleet of Æneas ſailing for Italy. On the firſt glaſs muſt be painted the ſea, as in the eleventh Experiment, or elſe the waves ſhould be imitated by another glaſs under the firſt. On the ſecond, the Trojan fleet. On the third, Neptune in his car. On the fourth, the palace of Jupiter. On the fifth, the inſide of the palace; the gods aſſembled in council, with Venus obtaining leave of Jupiter for Æneas to land in Italy.—After having placed the firſt glaſs, that repreſents a calm ſea, the curtain is raiſed, and the ſecond ſcene is advanced, which contains the Trojan fleet. The firſt is then brought forward, to repreſent a violent tempeſt: then raiſing the third glaſs, Neptune appears, who commands the waves to be ſtill, which is done by making the tempeſt ſubſide by degrees. The fleet then advances, and paſſes over the whole theatre: preſently after the fourth and fifth ſcenes deſcend, that repreſent Olympus, and finiſh the exhibition.

Note, We muſt here repeat, that if you would repreſent a ſubject of this ſort to advantage, it is quite neceſſary that the glaſſes be well painted; and thoſe that are to be in front ſhould be in ſtronger and more opaque colours, that the images of thoſe behind may not appear mixed with them, which will be the caſe if they are all equally tranſparent. The glaſſes ſhould alſo be of different lengths; that ſome being placed before the others are drawn away, their extremities may not be perceived.

The larger theſe ſubjects are repreſented, the better effect they will have: the front of the theatre ſhould appear to be about three feet wide; and if ſome parts of the figures were moveable, it would ſtill add to the variety of the entertainment.

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(c) He that moves the glaſſes, ſeeing the effect they produce, is the better able to render the repreſentation as natural as poſſible.

DIOSCOREA, in botany: A genus of the hexandria order, belonging to the diœcia claſs of plants; and in the natural method ranking under the 11th order, *Sarmentaceæ*. The male calyx is ſexpartite; there is no corolla: The female calyx is ſexpartite; no corolla; three ſtyles; the capſule trilocular and compreſſed; and there are two membranaceous ſeeds. There are eight ſpecies, of which the only remarkable one is the bulbifera, or yam. This hath triangular winged ſtalks, which trail upon the ground, and extend a great way: theſe frequently put out roots from their joints as they lie upon the ground, by which the plants are multiplied. The roots are eaten by the inhabitants of both the Indies; and are particularly ſerviceable in the Weſt India iſlands, where they make the greateſt part of the negroes food. The plant is ſuppoſed to have been brought from the Eaſt to the Weſt Indies; for it has never been obſerved to grow wild in any part of America; but in the iſland of Ceylon, and on the coaſt of Malabar, it grows in the woods, and there are in thoſe places a great variety of ſorts. It is propagated by cutting the root in pieces, obſerving to preſerve an eye in each, as is practiſed in planting potatoes. One plant will produce three or four large roots. The ſkin of theſe roots is pretty thick, rough, unequal, covered with many ſtringy fibres or filaments, and of a violet colour approaching to black. The inſide is white, and of the conſiſtence of red beet. It reſembles the potato in its mealineſs, but is of a cloſer texture. When raw, the yams are viſcous and clammy: when roaſted or boiled, they afford very nouriſhing food; and are often preferred to bread by the inhabitants of the Weſt Indies, on account of their lightneſs and facility of digeſtion. When firſt dug out of the ground, the roots are placed in the ſun to dry: after which, they are either put into ſand, dry garrets, or caſks; where, if kept from moiſture, they may be preſerved whole years, without being ſpoiled or diminiſhed in their goodneſs. The root commonly weighs two or three pounds; tho' ſome yams have been found upwards of 20 pounds weight.

DIOSCORIDES, a phyſician of Cilicia, who lived, as ſome ſuppoſe, in the age of Nero. He was originally a ſoldier; but afterwards he applied himſelf to ſtudy, and wrote a book upon medicinal herbs.

DIOSCURIA (διοσκουρια, from Διος *Jupiter*, and κουροι *infants*), in antiquity, a feſtival in honour of the Διοσκουροι, or Caſtor and Pollux, who were reputed to be the ſons of Jupiter. It was obſerved by the Cyreneans, but more eſpecially by the Spartans, whoſe country was honoured by the birth of theſe heroes. The ſolemnity was full of mirth, being a time wherein they ſhared plentifully of the gifts of Bacchus, and diverted themſelves with ſports, of which wreſtling matches always made a part.

DIOSMA, AFRICAN SPIRÆA: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The corolla is pentapetalous, the nectarium crown-ſhaped above the germen; there are five capſules coalited; the ſeeds hooded. There are nine ſpecies; of which the moſt remarkable are the hirſuta, with narrow hairy leaves; and the oppoſitifolia, with leaves placed in the form of a croſs. The firſt is a very handſome ſhrub, growing to the height of five or ſix feet: the ſtalks are of a fine coral colour: the leaves come out alternately on every ſide of the branches, and are narrow-pointed and hairy: the flowers are produced in ſmall cluſters at the end of the ſhoots, and are of a white colour. They are ſucceeded by ſtarry ſeed-veſſels having five corners; in each of which corners is a cell, containing one ſmooth, ſhining, oblong, black ſeed: theſe ſeed-veſſels abound with a reſin which emits a grateful ſcent, as doth alſo the whole plant.—The ſecond ſpecies riſes to the height of three or four feet: the branches are ſlender, and produced from the ſtem very irregularly; the leaves are placed croſs-ways; the flowers are produced at the ends of the branches, between the leaves: the plants continue a long time in flower, and make a fine appearance when they are intermixed with other exotics in the open air. Both ſpecies are propagated by cuttings; which may be planted during any of the ſummer-months in pots, and plunged into a moderate hot-bed, where they ſhould be ſhaded from the ſun, and frequently watered. In about two months they will have taken root; when each ſhould be tranſplanted into a ſmall pot where they are to remain; but during winter, like moſt other exotic plants, they muſt be preſerved in a green-houſe.

DIOSPOLIS (anc. geog.), a city of the Delta, or Lower Egypt; to the ſouth of the Buſiritic branch, before it divides into two.—Another of Bithynia, in the territory of Heraclea.—A third, called *Magna*, denoting Thebæ of the Higher Egypt.—A fourth, *Dioſpolis Parva*, the metropolis of the Nomos Dioſpolites of the Higher Egypt.—A fifth, *Dioſpolis* of Samaria, the ſame with Lydda.—A ſixth *Dioſpolis*, the ancient name of Laodicea of Phrygia on the Lycus.

DIOSPOLITES NOMOS (Ptolemy), a diviſion of Thebais or the Higher Egypt, to diſtinguiſh it from another of the Lower Egypt or the Delta; to the ſouth of the Nomos Thinites, on the weſt ſide of the Nile.

DIOSPYROS, the INDIAN DATE-PLUM: A genus of the diœcia order, belonging to the polygamia claſs of plants; and in the natural method ranking under the 18th order, *Bicornes*. The calyx is hermaphrodite and quadrifid; the corolla urceolated and quadrifid; there are eight ſtamina; the ſtyle quadrifid; the berry octoſpermous: the male calyx, corolla, and ſtamina, as in the former. There are two ſpecies. 1. The lotus, which is ſuppoſed to be a native of Africa, from whence it was tranſplanted into ſeveral parts of Italy, and alſo into the ſouth of France. The fruit of this tree is ſuppoſed to be the lotus with which Ulyſſes and his companions were enchanted, and which made thoſe who eat of it forget their country and relations: (See alſo RHAMNUS.) In the warm parts of Europe this tree grows to the height of 30 feet. In the botanic garden at Padua, there is one very old tree which has been deſcribed by ſome of the former botaniſts under the title of *guaiacum patavinum*. This tree produces plenty of fruit every year; from the ſeeds of which many plants have been raiſed. 2. The Virginiana, pinſhamin, perſimon, or pitchumon plum, is a native of America, but particularly of Virginia and Carolina. The ſeeds of this ſort have been frequently imported into Britain, and the trees are common in many nurſeries about London. It riſes to the height of 12 or 14 feet; but generally divides into many irregular trunks

trunks near the ground, ſo that it is very rare to ſee a handſome tree of this ſort. Though plenty of fruit is produced on theſe trees, it never comes to perfection in this country. In America the inhabitants preſerve the fruit till it is rotten, as is practiſed with medlars in England; when they are eſteemed very pleaſant. Both ſpecies are propagated by ſeeds: and the plants require to be treated tenderly while young; but when they are grown up, they reſiſt the greateſt cold of this country.

DIPHTHONG, in grammar, a double vowel, or the mixture of two vowels pronounced together, ſo as to make one ſyllable.

The Latins pronounced the two vowels in their diphthongs ae or æ, oe or œ, much as we do; only that the one was heard much weaker than the other, tho' the diviſion was made with all the delicacy imaginable. Diphthongs, with regard to the eyes, are diſtinguiſhed from thoſe with regard to the ears: In the former, either the particular ſound of each vowel is heard in the pronunciation; or the ſound of one of them is drowned; or, laſtly, a new ſound, different from either, reſults from both: the firſt of theſe only are real diphthongs, as being ſuch both to the eye and ear. Diphthongs with regard to the ear are either formed of two vowels meeting in the ſame ſyllable, or whoſe ſounds are ſeverally heard; or of three vowels in the ſame ſyllable, which only afford two ſounds in the pronunciation.

Engliſh diphthongs, with regard to the eye and ear, are *ai, au, ea, ee. oi, oo, ou.* Improper Engliſh diphthongs, with regard to the eye only, are *aa, ea, eo, eu, ie, ei, oa, oe, ue, ui.*

DIPLOE, in anatomy, the ſoft meditullium, or medullary ſubſtance, which lies between the two laminæ of the bones of the cranium. See ANATOMY, n° 11.

DIPLOMA. See DIPLOMATICS.

In a peculiar ſenſe, it is uſed for an inſtrument or licence given by colleges, ſocieties, &c. to a clergyman to exerciſe the miniſterial function, or to a phyſician to practiſe the profeſſion, &c. after paſſing examination, or admitting him to a degree.

*Bielfield's Elements.*

DIPLOMATICS, the ſcience of diplomas, or of ancient literary monuments, public documents, &c. It does not however, nor can it, abſolutely extend its reſearches to antiquity; but is chiefly confined to the middle age, and the firſt centuries of modern times. For though the ancients were accuſtomed to reduce their contracts and treaties into writing; yet they, graved them on tables, or covered them over with wax, or braſs, copper, ſtone, or wood, &c. And all that in the firſt ages were not traced on braſs or marble, has periſhed by the length of time, and the number of deſtructive events.

1. The word *diploma* ſignifies, properly, a letter or epiſtle, that is folded in the middle, and that is not open. But, in more modern times, the title has been given to all ancient epiſtles, letters, literary monuments, and public documents, and to all thoſe pieces of writing which the ancients called *Syngrapha, Chirographa, Codicilli,* &c. In the middle age, and in the diplomas themſelves, theſe writings are called *Litteræ, Præcepta, Placita, Chartæ indiculæ, Sagilla,* and *Bullæ;* as alſo *Panchartæ, Pantochartæ, Tractoriæ, Deſcriptiones,* &c. The originals of theſe pieces are named *Examplaria,* or *Autographa, Chartæ authenticæ, Originalia,* &c. and the copies, *Apographa, Copiæ, Particulæ,* and ſo forth. The collections that have been made of them, are called *Chartaria* and *Chartulia.* The place where theſe papers and documents were kept, the ancients named *Scrinia, Tabularium,* or *Ærarium,* words that were derived from the tables of braſs, and, according to the Greek idiom, *Archeium* or *Archivum.*

2. In order to underſtand the nature of theſe ancient papers, diplomas, and manuſcripts, and to diſtinguiſh the authentic from the counterfeit, it is neceſſary to know that the paper of the ancients came from Egypt, and was formed of thin leaves or membranes, taken from the branches of a tree named *Papyrus,* or *Biblum Ægyptiacum,* and which were paſted one over the other with the ſlime of the Nile, and were preſſed and poliſhed with a pumice-ſtone. This paper was very ſcarce; and it was of various qualities, forms, and prices, which they diſtinguiſhed by the names of *charta hieratica, luria, auguſta, amphitheatrica, ſaitica, tanirica, emporetica,* &c. They cut this paper into ſquare leaves, which they paſted one to the other, in order to make rolls of them: from whence an entire book was called *volumen,* from *volvendo;* and the leaves of which it conſiſted, *paginæ.* Sometimes, alſo, they paſted the leaves all together by one of their extremities, as is now practiſed in binding; by this method they formed the back of a book, and theſe the learned call *codices.* They rolled the volume round a ſtick, which they named *umbilicus;* and the two ends that came out beyond the paper, *cornua.* The title, wrote on parchment, in purple characters, was joined to the laſt ſheet, and ſerved it as a cover. They made uſe of all ſorts of ſtrings or ribbands, and even ſometimes of locks, to cloſe the book; and ſometimes alſo it was put into a caſe. But there is not now to be found, in any library or cabinet whatever, any one of theſe volumes. We have been aſſured, however, by a traveller, that he had ſeen ſeveral of them in the ruins of Herculaneum; but ſo damaged, the paper ſo ſtiff and brittle, by the length of time, that it was impoſſible to unrol them, and conſequently to make any uſe of them; for on the firſt touch they fell into ſhatters.

3. We are ignorant of the preciſe time when our modern paper was invented: and when they began to make uſe of pens in writing, inſtead of the ſtalks of reeds. The ink that the ancients uſed, was not made of vitriol and galls, like the modern, but of ſoot Sometimes alſo they wrote with red ink made of vermilion; or in letters of gold, on purple or violet parchment. It is not difficult for thoſe who apply themſelves to this ſtudy, to diſtinguiſh the parchment of the ancients from that of the moderns, as well as their ink and various exterior characters: but that which beſt diſtinguiſhes the original from the counterfeit is, the writing or character itſelf; which is ſo diſtinctly different from one century to another, that we may tell with certainty, within about 40 or 50 years, when any diploma was written. There are two works which furniſh the cleareſt lights on this matter, and which may ſerve as ſure guides in the judgments we may have occaſion to make on what are called *ancient diplomas.* The one is the celebrated treatiſe on the Diplomatic, by F. Mabillon; and the other, the firſt volume of the Chro-

nicon Gotvicenſe. We there find ſpecimens of all the characters, the flouriſhes, and different methods of writing, of every age. For theſe matters, therefore, we muſt refer our readers to thoſe authors; and ſhall here only add, that,

4. All the diplomas are wrote in Latin, and conſequently the letters and characters have a reſemblance to each other: but there are certain ſtrokes of the pen which diſtinguiſh not only the ages, but alſo the different nations; as the writings of the Lombards, French, Saxon, &c. The letters in the diplomas are alſo uſually longer, and not ſo ſtrong as thoſe of manuſcripts. There has been alſo introduced a kind of court-hand, of a very diſproportionate length, and the letters of which are called *Exiles litteræ, criſpæ, ac protractiores.* The firſt line of the diploma, the ſignature of the ſovereign, that of the chancellor, notary, &c. are uſually wrote in this character.

5. The ſignature of a diploma conſiſts either of the ſign of the croſs, or of a monogram or cipher, compoſed of the letters of the names of thoſe who ſubſcribed it. The initial letters of the name, and ſometimes alſo the titles, were placed about this croſs. By degrees the cuſtom changed, and they invented other marks; as, for example, the ſign of Charlemagne was thus:

R
K—A—S
V
L

They ſometimes added alſo the dates and epoch of the ſignature, the feaſts of the church, the days of the kalendar, and other like matters. The ſucceſſive corruption of the Latin language, the ſtyle and orthography of each age, as well as their different titles and forms; the abbreviations, accentuation, and punctuation, and the various methods of writing the diphthongs; all theſe matters united, form ſo many characters and marks by which the authenticity of a diploma is to be known.

6. The ſeal annexed to a diploma was anciently of white wax, and artfully imprinted on the parchment itſelf. It was afterward pendent from the paper, and incloſed in a box or caſe, which they called *bulla*. There are ſome alſo that are ſtamped on metal, and even on pure gold. When a diploma bears all the characters that are requiſite to the time and place where it is ſuppoſed to be written, its authenticity is not to be doubted: but, at the ſame time, we cannot examine them too ſcrupulouſly, ſeeing that the monks and prieſts of former ages have been very adroit in making of counterfeits; and the more, as they enjoyed the confidence of princes and ſtateſmen, and were even ſometimes in poſſeſſion of their rings or ſeals.

7. With regard to manuſcripts that were wrote before the invention of printing, it is neceſſary (1.), to know their nature, their eſſential qualities, and matter; (2.) to be able to read them freely, and without error; (3.) to judge of their antiquity by thoſe characters which we have juſt mentioned with regard to the diplomas; and, (4.) to render them of uſe in the ſciences. As there are ſcarce any of the ancient codes now remaining (ſee par. 2.), wrote on the Egyptian paper, or on wood, ivory, &c. we have only to conſider thoſe that are written on parchment or vellum *(membraneos)*, and ſuch as are wrote on our paper *(chartaceos)*. The former of theſe are in moſt eſteem. With regard to the character, theſe codes are written either in ſquare and capital letters, or in half ſquare, or round and ſmall letters. Thoſe of the firſt kind are the moſt ancient. There are no intervals between the words, no letters different from the others at the beginning of any word, no points, nor any other diſtinction. The codes which are wrote in letters that are half ſquare, reſemble thoſe we have in Gothic characters, as well for the age as the form of the letters. Such as are wrote in round letters are not ſo ancient as the former, and do not go higher than the ninth or tenth century. Theſe have ſpaces between the words, and ſome punctuation. They are likewiſe not ſo well wrote as the preceding, and are frequently disfigured with comments. The codes are divided, according to the country, into Lombard, Italian, Gaulic, Franco-Gaulic, Saxon, Anglo-Saxon, &c.

8. In the ancient Greek books, they frequently terminated the periods of a diſcourſe, inſtead of all other diviſion, by lines; and theſe diviſions were called, in Latin, *verſus*, from *vertendo:* for which reaſon theſe lines are ſtill more properly named *verſus* than *lineæ*. At the end of a work, they put down the number of verſes of which it conſiſted, that the copies might be more eaſily collated: and it is in this ſenſe we are to underſtand Trebonius, when he ſays, that the pandects contain 150,000 *pæne verſuum*. Theſe codes were likewiſe *vel probæ vel deterioris notæ*, more or leſs perfect, not only with regard to the calligraphy or beauty of the character, but to the correction of the text alſo.

9. It is likewiſe neceſſary to obſerve, in ancient codes, the abbreviations, as they have been uſed in different centuries. Thus, for example, A. C. D. ſignifies, Aulus Caius Decimus; Ap. Cn. Appius Cneius; Aug. Imp. Augeſtus Imperator. The characters that are called *notæ*, are ſuch as are not to be found in the alphabet; but which, notwithſtanding, ſignify certain words. All theſe matters are explained in a copious manner by Voſſius, and in the Chronicon Gotvicenſe. Laſtly, the learned divide all the ancient codes into *codices minus raros, rariores, editos, & anecdotos*. The critical art is here indiſpenſably neceſſary: its reſearches, moreover, have no bounds; and the more, as the uſe of it augments every day, by the diſcoveries that are made in languages, and by the increaſe of erudition.

DIPONDIUS, in the ſcripture-language, is uſed by St Luke to ſignify a certain coin which was of very little value. Our tranſlation of the paſſage is, *Are not two ſparrows ſold for two farthings?* In St Matthew, who relates the ſame thing, we read *Are not two ſparrows ſold for a farthing?* The Greek reads *aſſarion* inſtead of *as*. Now *aſſarion*, as ſome ſay, was worth half an *as*, that is to ſay, four French deniers and $\frac{1}{8}$th; and, according to others, two deniers and $\frac{5}{16}$ths. *Dipondius* ſeems rather to ſignify half an *as*. Calmet, Diction. Bibl. Luke xii. 6. Matt. x. 29.

Dr Arbuthnot differs in opinion from the author laſt quoted. He ſays, that this coin was at firſt *libralis*, or of a pound weight; and even when diminiſhed, it retained the name of *libella*. So that *dipondius* denotes two aſſes.

DIPPING, among miners, ſignifies the interruption

tion or breaking off the veins of ore; an accident that gives them a great deal of trouble before they can diſcover the ore again. A great deal of the ſkill of the miners conſiſts in the underſtanding this dipping of the veins, and knowing how to manage in it. In Cornwall they have this general rule to guide them in this reſpect: moſt of their tin-loads, which run from eaſt to weſt, conſtantly dip towards the north. Sometimes they underlie; that is, they ſlope down towards the north three feet in height perpendicular. This muſt carefully be obſerved by the miners, that they may exactly know where to make their air-ſhafts when occaſion requires; yet, in the higher mountains of Dartmaer, there are ſome conſiderable loads, which run north and ſouth; theſe always underlie toward the eaſt. Four or five loads may run nearly parallel to each other in the ſame hill; and yet, which is rare, they may meet all together in one hatch, as it were a knot, which well tins the place, and ſo ſeparate again, and keep their former diſtances.

*DIPPING-Needle*, an inſtrument uſed for obſerving the quantity of inclination towards the earth, aſſumed by any needle or other body after it has acquired the magnetic virtue. This was firſt obſerved by one Robert Norman, an Engliſhman, and maker of compaſſes for mariners, in the end of the 16th century; who finding that he was always obliged to counterbalance that end which turns to the north by a bit of wax or ſuch other ſubſtance, though the balance had been ever ſo exact before, publiſhed an account of his diſcovery as a matter of importance. The ſubject was inſtantly attended to; and inſtruments were not only contrived for aſcertaining the quantity of the dip, but various ſpeculations formed concerning the cauſe of ſuch a ſurpriſing phenomenon.

The general phenomena of the dipping-needle are: That about the equatorial parts of the earth it remains in an horizontal poſition, but depreſſes one end as we recede from theſe; the north end if we go towards the north, and the ſouth end if we proceed towards the ſouth pole. The farther north or ſouth that we go, the inclination becomes the greater; but there is no place of the globe hitherto diſcovered where it points directly downwards, though it is ſuppoſed that it would do ſo in ſome part very near the pole. Its inclination is likewiſe found to vary very conſiderably at different times in different places of the earth, and by ſome changes of ſituation in ſuch a manner as muſt appear at firſt ſight very unaccountable. Of all thoſe who have attempted the inveſtigation of this obſcure ſubject, none have been more ſucceſsful than M. Cavallo, who in his Treatiſe on Magnetiſm has given particular attention to all the phenomena, and accounted for them upon plain and rational principles, in the following manner.

The dip of the magnetical needle in general may be underſtood from the following eaſy experiment: Lay an oblong magnet horizontally upon a table, and over it ſuſpend another ſmaller magnet (a ſewing needle to which the magnetic virtue has been communicated will anſwer the purpoſe), in ſuch a manner as to remain in an horizontal poſition when not diſturbed by another magnet. Now, if this laſt ſmall magnet or ſewing needle, ſuſpended by the middle, be brought juſt over the middle of the large one, it will turn itſelf in ſuch a manner that the ſouth pole of the ſmall magnet will point towards the north pole of the large one; and if at an equal diſtance from both, will remain in an horizontal poſition. But if we move it nearer to one of the poles than the other, it will readily be underſtood that the correſponding end of the needle will be attracted by the pole to which it approaches, and of conſequence inclined downwards; the contrary end being proportionably elevated. It is likewiſe evident, that this inclination will be greater or leſs according to the diſtance at which the ſmall magnet is placed from the pole of the large one; the attraction of the neareſt pole having always the greateſt effect upon it. And it is equally plain, that when brought directly over one of the poles of the large magnet, it will turn its own contrary one directly towards it, and thus lie exactly in the axis of the large one.

The application of this experiment to the phenomena of the dipping-needle is obvious, as nothing more is requiſite for ſolving the whole myſtery than to ſuppoſe the earth itſelf to be the large magnet, and the magnetic needle or any other magnetic body the ſmall magnet in the experiment: for admitting that the *north* pole of the earth poſſeſſes a *ſouth* magnetiſm, and that the oppoſite pole is poſſeſſed of a north magnetical polarity; it appears, and the theory is confirmed by experiment, that when a magnet is ſuſpended properly in the equatorial parts of the world, it muſt remain in an horizontal poſition; but when removed nearer to one of the poles, it muſt incline one of its extremities, *viz.* that which is poſſeſſed of the contrary magnetic polarity; and that this inclination muſt increaſe in proportion as the magnet or magnetic needle recedes from the equator of the earth; and, laſtly, when brought exactly upon either of the poles of the earth, it muſt ſtand perpendicular to the ground, or in the ſame direction with the axis of the earth.

The only difficulty in this explanation ariſes from the attributing a ſouth magnetiſm to the north pole of the earth: but by this our author means only that its magnetiſm is contrary to that end of the magnetic needle which turns towards it; and in the ſame manner it muſt be underſtood, that the ſouth pole of the earth has a north magnetic polarity.

If the extremities of the axis of the earth, or the poles about which it performs its diurnal revolution, coincided with its magnetic poles, or even if the magnetic poles were always at a certain diſtance from them, the inclination of the needle would be always the ſame at equal diſtances from the equator, and might be very uſeful for determining the latitudes. But it would ſeem, that theſe poles are perpetually ſhifting their place, ſince both the inclination and horizontal direction of the needle are continually varying even in the ſame place; ſo that its quantity of inclination cannot be exactly calculated. Two general remarks may be made upon this ſubject. 1. That the inclination of the needle does not alter regularly in going from north to ſouth, or from ſouth to north, in any meridian. 2. That its alteration in the ſame place, and at different times, is but ſmall. Thus, in London, about the year 1576, the dip was 71° 50′ below the horizon, and in 1775 it ſtood at 72° 3′; the alteration in near 200 years

years ſcarce amounting to three quarters of a degree, which may be attributed to the errors of the inſtruments; as theſe were at firſt exceedingly erroneous, and even yet are far from being arrived at perfection.

The general method of conſtructing dipping-needles is, to paſs an axis quite through the needle itſelf, and to let the extremities of the axis reſt upon two ſupports, like the beam of a pair of ſcales, that the needle may move vertically round; and hence, when placed in the magnetic meridian, it will naturally aſſume that poſition which is called the *magnetic line*, *viz.* the two ends nearly north and ſouth, and one of them inclined conſiderably to the horizon. The degrees of this inclination are ſhown upon a graduated circle; and when the inſtrument is made uſe of at land it has a ſtand, but at ſea a ring is neceſſary to ſuſpend it. When furniſhed with a ſtand, it has alſo a ſpirit-level; and the ſtand has three ſcrews, by which the whole is adjuſted in ſuch a manner as to let the centre of motion in the needle, and the mark of 90° on the lower part of the divided circle, be exactly in the ſame line perpendicular to the horizon.

The greateſt imperfections attending this inſtrument are the balancing of the needle itſelf, and the difficulty of knowing whether, after being made magnetic, it be properly balanced or not. The inaccuracy here indeed can be but very ſmall, as ariſing only from duſt or moiſture. The method recommended by Mr Cavallo to obviate theſe inconveniences, is firſt to obſerve the dip of the needle; then to reverſe its magnetiſm by the application of magnets, ſo that the end of it which before was elevated above the horizon may now be below it; and, laſtly, to obſerve its dip again; for a mean of the two obſervations will be pretty near the truth, though the needle may not be perfectly balanced. See MAGNETISM, and *MAGNETICAL Needle*.

DIPSACUS, TEAZEL, in botany: A genus of the monogynia order, belonging to the tetrandia claſs of plants; and in the natural method ranking under the 48th order, *Aggregatæ*. The common calyx is polyphyllous, proper above; the receptacle paleaceous. There are four ſpecies; the moſt remarkable of which is the carduus fullonum, which grows wild in many parts of England. It is of ſingular uſe in raiſing the knap upon woollen cloth. For this purpoſe, the heads are fixed round the circumference of a large broad wheel, which is made to turn round, and the cloth is held againſt them. In the weſt of England, great quantities of the plant are cultivated for the uſe juſt now mentioned. It is propagated by ſowing the ſeeds in March, upon a ſoil that is well prepared. About one peck of ſeed is ſufficient for an acre, as the plants muſt have room to grow; otherwiſe the heads will not be large enough, nor in great quantity. When the plants come up, they muſt be hoed in the ſame manner as is practiſed for turnips, cutting down all the weeds, and thinning the plants to about eight inches diſtance; and as the plants advance, and the weeds begin to grow again, they muſt be hoed a ſecond time, cutting out the plants to a wider diſtance, ſo that they may finally ſtand a foot diſtant from each other. The ſecond year they will ſhoot up heads, which may be cut about the beginning of Auguſt. They are then to be tied up in bunches, and ſet in the ſun if the weather is fair; or if not, in rooms to dry them. The common produce is about 160 bundles or ſtaves upon an acre, which are ſold for one ſhilling each.

The leaves of the common wild teazel, dried, and given in powder or infuſion, are a very powerful remedy againſt flatuſes and crudities in the ſtomach. There is alſo another, though ſomewhat whimſical, uſe for which this plant is famous among the country people in England. If the heads are opened longitudinally, about September or October, there is generally found a ſmall worm in them: one of theſe only is found in each head, whence naturaliſts have named it the *vermis ſolitarius dipſaci*. They collect three, five, or ſeven of theſe, always obſerving to make it an odd number; and, ſealing them up in a quill, give them to be worn as an amulet againſt the ague. This ſupperſtitious remedy is in much higher repute than the bark, in many parts of England.

DIPSAS, a ſort of ſerpent, the bite of which produces ſuch a thirſt as proves mortal; whence its name *dipſas*, which ſignifies thirſty. In Latin it is called *ſitula*, "a pail." Moſes ſpeaks of it in Deut. viii. 15.

DIPTERA (from δις, and ϖτερον, *wing)*, in zoology, an order of inſects, which have only two wings, and under each wing a ſtyle or oblong body, terminated by a protuberance or head, and called a *balancer*.

DIPTOTES, in grammar, are ſuch nouns as have only two caſes, as *ſuppetiæ*, *ſuppetias*, &c.

DIPTYCHA, in antiquity, a public regiſter, wherein were written the names of the conſuls, and other magiſtrates, among the heathens; and of biſhops, and defunct as well as ſurviving brethren, among the Chriſtians.

The word is formed from the Greek διπτυχων, or διπτυχα, and that from διπτυξ, a maſculine noun derived from ϖτυσσω *I fold*, or *plait*. From its future ϖτυξω is formed ϖτυξ a *fold* or *plait*, to which adding δις *twice*, we have διπτυξ, in the genitive διπτυχος, whence the nominative neuter διπτυχον, q. d. *a book folded in two leaves*; though there were ſome in three, and others in four or five leaves. An ingenious author imagines this name to have been firſt given them to diſtinguiſh them from the books that were rolled, called *volumina*.

It is certain there were profane diptycha in the Greek empire, as well as ſacred ones in the Greek church. The former were the matricula, or regiſter, wherein the names of the magiſtrates were entered; in which ſenſe diptycha is a term in the Greek chancery.

*Sacred* DIPTYCHA. The word is plural; diptycha being a double catalogue, in one whereof were written the names of the living, and in the other thoſe of the dead, which were to be rehearſed during the office. We meet with ſomething not unlike the ſacred diptychs of the Greeks, in the canon of the maſs according to the Latin uſage; where the people are enjoined to pray once for the living, and once for the dead; ſeveral ſaints are invoked in different times, &c. In theſe diptycha were entered the names of biſhops, who had governed their flocks aright; and theſe were never expunged out of the ſame, unleſs they were convicted of hereſy, or ſome other groſs crime. In the diptycha were likewiſe entered the names of ſuch as had done any ſignal ſervice to the church, whether they were living or dead, and mention was made of them in the celebration of the liturgy.

Caſaubon, in his obſervations on Athenæus, lib. vi. cap. 14. ſuppoſes the Chriſtians to have borrowed the cuſtom of writing names in a book, and rehearſing them at maſs, from the heathens, who entered the names of perſons they would do any ſignal honour to, in the verſes of the Salii; as was done to Germanicus and Verus, ſons of the emperor Marcus Aurelius, and long time before, during the age of the republic, to Mamureus Veturius, and Lucia Volumnia, as we are told by Tacitus, lib ii. Spartian, Ovid, Feſtus, Plutarch, &c. But Fa. Roſweyd does not approve this notion of Caſaubon. The pretended St Dionyſius, a very ancient author, ſays the contrary, and aſſerts the firſt eſtabliſhment of this uſage to have been founded on Scripture, 2 Tim. ii. 19. Pſalm cxvi. 15. Roſweyd adds Eccleſiaſtic. xliv. 1. and takes theſe to have been the paſſages the ancient church had a view to, rather than the Salian verſes.

The profane diptycha were frequently ſent as preſents to princes, &c. on which occaſion they were finely gilt, and embelliſhed; as appears from Symmachus, lib. ii. ep. 81. Thoſe preſented were uſually of ivory. The firſt law, De Expenſ. Ludor. C. Theod. forbids all magiſtrates below conſuls to make preſents of diptycha of ivory in the puplic ceremonies.

DIRCA, in botany: A genus of the monogynia order, belonging to the octandria claſs of plants; and in the natural method ranking under the 31ſt order, *Vepreculæ*. There is no calyx; the corolla is tubular, with the limb indiſtinct; the ſtamina are longer than the tube; the berry is monoſpermous.

DIRÆ, the general name of the three Furies in the Pagan ſyſtem of theology. They were ſo called, as being *quaſi Deorum iræ*, the miniſters of divine vengeance in puniſhing guilty ſouls after death. They were the daughters of *Night* and *Acheron*. See FURIES.

DIRECTION, in mechanics, ſignifies the line or path of a body's motion, along which it endeavours to proceed according to the force impreſſed upon it. See MECHANICS.

DIRECTOR, in commercial polity, a perſon who has the management of the affairs of a trading company: thus we ſay, the directors of the India company, South-ſea company, &c. See COMPANY.

The directors are conſiderable proprietors in the ſtocks of their reſpectives companies, being choſen by plurality of votes from among the body of proprietors. The Dutch Eaſt India company have 60 ſuch directors; that of France, 21; the Britiſh Eaſt India company has 24, including the chairman, who may be re-elected for four years ſucceſſively. Theſe laſt have ſalaries of 150l. a-year each, and the chairman 200l. They meet at leaſt once a-week, and commonly oftener, being ſummoned as occaſion requires. The directors of the Bank of England are 24 in number, including governor and deputy governor.

DIRECTOR, in ſurgery, a grooved probe, to direct the edge of the knife or ſciſſars in opening ſinuſes or fiſtulæ, that by this means the adjacent veſſel, nerves, and tendons, may remain unhurt. See SURGERY.

DIRIBITORES, among the Romans, officers appointed to diſtribute tablets to the people at the comitia. See COMITIA.

DIRIGENT, or DIRECTRIX, a term in geometry, ſignifying the line of motion, along which the deſcribent line or ſurface is carried in the geneſis of any plane or ſolid figure.

DIS, an inſeparable article prefixed to divers words; the effect whereof is either to give them a ſignification contrary to what the ſimple words have, as *diſoblige*, *diſobey*, &c.; or to ſignify a ſeparation, detachment, &c. as *diſpoſing*, *diſtributing*.

DIS, a town of Norfolk, ſeated on the river Waveney, on the ſide of a hill. It is a neat flouriſhing town, with one large church, a Preſbyterian and a Quaker meeting. It has about 600 good houſes, the ſtreets are well paved, pretty wide, and always clean. At the weſt end of the town is a large meer or lake; but ſo muddy, that the inhabitants can make no other uſe of it but in catching of eels. In the town are carried on manufactories of ſail-cloth, hoſe, and the making of ſtays. E. Long. 1. 16. N. Lat. 52. 25.

DIS, a god of the Gauls, the ſame as Pluto the god of hell. The inhabitants of Gaul ſuppoſed themſelves deſcended from that deity.

DISA, in botany: A genus of the diandria order, belonging to the gynandria claſs of plants. The ſpatha is univalvular; the petals three; the third ſmaller than the reſt, bifid, and gibbous at the baſe.

DISABILITY, in law, is when a man is diſabled, or made incapable to inherit any lands, or take that benefit which otherwiſe he might have done: and this may happen four ways; by the act of an anceſtor, or of the party himſelf; by the act of God, or of the law. 1. Diſability by the act of the anceſtor, is where the anceſtor is attainted of high treaſon, &c. which corrupts the blood of his children, ſo that they may not inherit his eſtate. 2. Diſability by the act of the party, is where a man binds himſelf by obligation, that, upon ſurrender of a leaſe, he will grant a new eſtate to a leſſee; and afterwards he grants over the reverſion to another, which puts it out of his power to perform it. 3. Diſability by the act of God, is where a man is *non ſanæ memoriæ*, whereby he is incapable to make any grant, &c. So that, if he paſſeth an eſtate out of him, it may after his death be made void; but it is a maxim in law, "That a man of full age ſhall never be received to diſable his own perſon." 4. Diſability by the act of the law, is where a man by the ſole act of the law, without any thing by him done, is rendered incapable of the benefit of the law; as an alien born, &c.

DISANDRA, in botany: A genus of the digynia order, belonging to the heptandria claſs of plants. The calyx has ſeven leaves; the corolla parted into ſeven, and flat; the capſule two-celled.

ISLANDS OF DISAPOINTMENT, are a cluſter of ſmall iſlands, lying in S. Lat. 14. 10. W. Long. 141. 16. They were diſcovered by Commodore Byron in 1765, who gave them their name from the ſhores affording no anchorage for his ſhips; for which reaſon he was obliged to quit them without landing, or procuring any refreſhments for his crew, who were then languiſhing with ſickneſs. They are inhabited by Indians, who appeared on the beach with ſpears in their hands, that were at leaſt 16 feet long. They every where diſcovered hoſtile intentions, and ſeemed by ſigns to threaten the people in the boat with death if they came aſhore. There are cocoa-trees in great abundance, and the ſhore abounds with turtle.

DISC, in antiquity, a quoit made of ſtone, iron, or copper, five or ſix fingers broad, and more than a foot long, inclining to an oval figure, which they hurled in form of a bowl, to a vaſt diſtance, by the help of a leathern thong tied round the perſon's hand who threw it, and put through a hole in the middle. Homer has made Ajax and Ulyſſes great artiſts at this ſport.

Disc, in aſtronomy, the body and face of the ſun and moon, ſuch as it appears to us on the earth; or the body and face of the earth, ſuch as it appears to a ſpectator in the moon.

Disc, in optics, is the width of the aperture of teleſcopic glaſſes, whatever their form be, whether plain, convex, concave, &c.

DISCERNING, or Discernment, a faculty of the mind whereby it diſtinguiſhes between ideas. See Metaphysics.

DISCIPLE, one who learns any thing from another: thus, the followers of any teacher, philoſopher, &c. are called *diſciples*. In the Chriſtian ſenſe, they were followers of Jeſus Chriſt, in general; but in a more reſtrained ſenſe, the diſciples denote thoſe alone who were the immediate followers and attendants on his perſon, of which there were 70 or 72. The names *diſciple* and *apoſtle* are often ſynonymouſly uſed in the goſpel-hiſtory; but ſometimes the apoſtles are diſtinguiſhed from diſciples, as perſons ſelected out of the number of diſciples, to be the principal miniſters of his religion: of theſe there were only 12. The Latins kept the feſtival of the 70 or 72 diſciples on July 15th, and the Greeks on January 4th.

DISCIPLINE, in a general ſenſe, denotes inſtruction and government, as military diſcipline, eccleſiaſtical diſcipline, &c.

Eccleſiaſtical diſcipline conſiſts in putting thoſe laws in execution by which the church is governed, and inflicting the penalties enjoined by them againſt the ſeveral ſorts of offenders that profeſs the religion of Jeſus. The primitive church never pretended to exerciſe diſcipline upon any but ſuch as were within her pale, in the largeſt ſenſe, by ſome act of their own profeſſion; and even upon theſe ſhe never pretended to exerciſe her diſcipline ſo far as to cancel or diſannul their baptiſm: all that ſhe pretended to, was to deprive men of the benefits of external communion, ſuch as public prayer, receiving the euchariſt, and other acts of divine worſhip. The church-diſcipline was only confined to the admonition of the party, and to the leſſer and greater excommunication.

As to the objects of eccleſiaſtical diſcipline, they were all ſuch delinquents as fell into great and ſcandalous crimes after baptiſm.

Diſcipline, in a more peculiar ſenſe, is uſed for the chaſtiſements or bodily puniſhments inflicted on a religious of the Romiſh church who has been found a delinquent; or even for that which the religious voluntarily undergo or inflict on themſelves, by way of modification.

*Book of Discipline* in the hiſtory of the church of Scotland, is a common order, drawn up by the aſſembly of miniſters in 1650, for the reformation and uniformity to be obſerved in the diſcipline and policy of the church. In this book the government of the church by prelates is ſet aſide, church-ſeſſions are eſtabliſhed, the ſuperſtitious obſervation of faſt-days and ſaints days is condemned, and other regulations for the government of the church are determined. This book was approved by the privy-council, and is called *the firſt book of diſcipline*.

DISCORD, in general, ſignifies diſagreement, or oppoſition between different perſons or things.

Discord, in muſic, every ſound which, joined with another, forms an aſſemblage diſagreeable to the ear; or rather, every interval whoſe extremes do not coaleſce. Now, as there are no other concords or conſonances, except thoſe which form amongſt themſelves, and with their fundamental ſound, perfect chords, it follows, that every other interval muſt be a real diſſonance or diſcord: even the third and ſixth were reckoned ſuch among the ancients, who excluded them from the number of conſonant chords.

The term *diſſonance*, which is ſynonymous with diſcord, is compounded of two words, the inſeparable prepoſition *dis* and the verb *ſonare*; which, both in a literal and metaphorical ſenſe, ſignifies *diſagreement* or *diſunion*. In reality, that which renders diſſonances grating, is, that the ſounds which form them, far from uniting in the ear, ſeem to repel each other, and are heard each by itſelf as two diſtinct ſounds tho' produced at the ſame time.

This repulſion or violent oſcillation of ſounds is heard more or leſs as the vibrations which produce it are more or leſs frequently coincident. When two vocal ſtrings are gradually tuned, till they approach a conſonant interval, the pulſations become ſlower as the chord grows more juſt, till at laſt they are ſcarcely heard, if heard at all; from whence it appears certain, that the pleaſure produced in us by harmony reſults from the more or leſs exact and frequent coincidence of vibrations; though the reaſon why this coincidence ſhould give pleaſure, more than any other modification or combination of ſounds, appears to us inſcrutable. The agreeable effects of diſſonance in harmony, are no objection to this theory; ſince it is allowed, that the ſenſations excited by diſcord are not in themſelves immediately and neceſſarily pleaſing, but only pleaſe by auricular deception. The ear is ſurpriſed with the ſhock it receives, without being able to imagine how it ſhould have happened; and in proportion as it is harſh and grating, we feel the pleaſure of returning harmony enhanced, and the diſappointment of being artfully and inſenſibly extricated more agreeable.

The name of *diſſonance*, is given ſometimes to the interval, and ſometimes to each of the two ſounds which form it. But though two ſounds equally form a diſſonance between themſelves, the name is moſt frequently given to that ſound in particular which is moſt extraneous to the chord.

The number of poſſible diſſonances is indefinite; but as in muſic we exclude all intervals which are not found in the ſyſtem received, the number of diſſonances is reduced to a very few: beſides, in practice, we can only ſelect from thoſe few, ſuch as are agreeable to the ſpecies, and the mode in which we compoſe; and from this

this laſt number we muſt exclude ſuch as cannot be uſed conſiſtently with the rules preſcribed. But what are theſe rules? Have they any foundation in nature, or are they merely arbitrary? This is what Rouſſeau, whom in this article we have followed or abandoned as his obſervations appeared uſeful or frivolous, propoſes to inveſtigate as its principal object.

But where does his ſcrutiny terminate? Not in the abolition of the rules preſcribed. Theſe have ſtill ſubſiſted, and will ſtill ſubſiſt, while the frame of man, and the nature of muſic, remain what they are. If then the rules be permanent and univerſal, the principle upon which they are founded may be latent or ambiguous; but the rules themſelves can never be purely arbitrary. How elſe could it happen, that Rameau, D'Alembert, and Rouſſeau, ſhould admit the force and effect of theſe rules, whilſt each of thoſe maſters exerts his whole genius to give a different account of their cauſe and origin? Rouſſeau himſelf, as we have ſeen in a former article, inculcates the neceſſity of diſſonances for the completion of harmony; (ſee CHORD). Now if this be true, the eaſieſt methods of introducing and diſmiſſing theſe diſcords muſt be the moſt eligible, and of conſequence the rules for uſing them muſt be eſtabliſhed. It is not then upon the ſubſiſtence or demolition of any particular theory that they depend. Should we attend to the particular objections which may be urged againſt any ſyſtem whatever; where is the theory which will be found proof againſt the efforts of ſcepticiſm? After all, the objections of Rouſſeau againſt Rameau's theory, as applied by D'Alembert to the origin of conſonances, (ſee MUSIC, art. 94, 95, 96, 97, 98, 99,) appear to be much more frivolous than the analogies from which he pretends this origin to be deduced. It appears from D'Alembert's expoſition of this theory, that, if not for all, it affords a ſolution for the moſt material and eſſential phenomena in harmony; which is ſufficient for its eſtabliſhment, till another can be found, which gives a rational and conſiſtent account of the whole: a diſcovery which has not yet been made. But, whilſt we acknowledge the futility of Rouſſeau's objections againſt D'Alembert's explication of diſſonances, we muſt at the ſame time admire the ingenuity with which he has deduced them from principles purely mechanical, without departing from the ſyſtem of M. Rameau. This mechanical explication will be found in his Muſical Dictionary, under the article *Diſſonance*.

**DISCORD**, (the goddeſs of), in Pagan theology. She is repreſented by Ariſtides with fiery eyes, a pale countenance, livid lips, and wearing a dagger in her boſom. It was ſhe who at the marriage of Peleus and Thetis threw in the golden apple, whereon was written "To the faireſt:" which occaſioned a contention between the goddeſſes Juno, Minerva, and Venus; each pretending a title to the apple. She was likewiſe called *Ate* and *Eris*.

**DISCOVERY**, in dramatic poetry, a manner of unravelling a plot or fable in tragedies, comedies, and romances; wherein, by ſome unforeſeen accident, a diſcovery is made of the name, fortune, quality, &c. of a principal perſon, which were before unknown. See CATASTROPHE.

**DISCOUNT**, in commerce, a term among traders, merchants, and bankers. It is uſed by the two former on occaſion of their buying commodities on the uſual time of credit, with a condition that the ſeller ſhall allow the buyer a certain diſcount at the rate of ſo much *per cent. per annum*, for the time for which the credit is generally given, upon condition that the buyer pays ready money for ſuch commodities, inſtead of taking the time of credit. Traders and merchants alſo frequently taking promiſſory notes for moneys due payable to them or order at a certain time, and ſometimes having occaſion for money before the time is elapſed, procure theſe notes to be diſcounted by bankers before the time of payment. Bills of exchange are alſo diſcounted by bankers; and in this conſiſts one article of the profits of banking. See BANK.

**DISCRETE**, or DISJUNCT, PROPORTION, is when the ratio of two or more pairs of numbers or quantities is the ſame, but there is not the ſame proportion between all the four numbers. Thus if the numbers 3 : 6 :: 8 : 16 be conſidered, the ratio between 3 : 6 is the ſame as that between 8 : 16, and therefore the numbers are proportional: but it is only diſcretely or disjunctly, for 3 is not to 6 as 6 to 8; that is, the proportion is broken off between 8 and 3, and is not continued as in the following continual proportionals, 3 : 6 :: 12 : 24.

**DISCRETION**, prudence, or knowledge to govern one's ſelf.

There are many more ſhining qualities in the mind of man, but there is none ſo uſeful as diſcretion; it is this indeed that gives a value to all the reſt, which ſets them at work in their proper times and places; and turns them to the advantage of the perſon who is poſſeſſed of them. Without it learning is pedantry, and wit impertinence; virtue itſelf looks like weakneſs; the beſt parts only qualify a man to be more ſprightly in errors, and active to his own prejudice.

Nor does diſcretion only make a man maſter of his own parts, but of other mens. The diſcreet man finds out the talents of thoſe he converſes with, and knows how to apply them to proper uſes. Accordingly, if we look into particular communities and diviſions of men, we may obſerve that it is the diſcreet man, not the witty, nor the learned, nor the brave, who guides the converſation, and gives meaſures to the ſociety. A man with great talents, but void of diſcretion, is like Polyphemus in the fable, ſtrong and blind, endued with an irreſiſtible force, which for want of ſight is of no uſe to him. Though a man has all other perfections, and wants diſcretion, he will be of no great conſequence in the world; but if he has this ſingle talent in perfection, and but a common ſhare of others, he may do what he pleaſes in his particular ſtation of life.

It is proper, however, to diſtinguiſh between *diſcretion* and *cunning*, the latter being the accompliſhment only of little mean ungenerous minds. Diſcretion points out the nobleſt ends to us, and purſues the moſt proper and laudable methods of attaining them: cunning has only private ſelfiſh aims, and ſticks at nothing which may make them ſucceed. Diſcretion has large and extended views, and, like a well-formed eye, commands a whole horizon: cunning is a kind of ſhortſightedneſs, that diſcovers the minuteſt objects which are near at hand, but is not able to diſcern things at a diſtance. Diſcretion, the more it is diſcovered, gives the greater authority to the perſon who poſſeſſes it: cunning,

cunning, when it is once detected, loſes its force, and makes a man incapable of bringing about even thoſe events which he might have done, had he paſſed only for a plain man. Diſcretion is the perfection of reaſon, and a guide to us in all the duties of life; cunning is a kind of inſtinct, that only looks out after our immediate intereſt and welfare. Diſcretion is only found in men of ſtrong ſenſe and good underſtanding: cunning is often to be met with in brutes themſelves, and in perſons who are but the feweſt removes from them. In ſhort, cunning is only the mimic of diſcretion, and may paſs upon weak men, in the ſame manner as vivacity is often miſtaken for wit, and gravity for wiſdom.

DISCUS, in antiquity. See Disc.

Discus, in botany, the middle part of a radiated compound flower, generally conſiſting of ſmall florets, with a hollow regular petal. It is commonly ſurrounded by large, plain, or flat, tongue-ſhaped petals, in the circumference or margin; as in daiſy, groundſel, and leopards bane: ſometimes the circumference is naked, as in cotton-weed and ſome ſpecies of colts-foot.

*Discus Folii*, the ſurface of the leaf.

DISCUSSION, in matters of literature, ſignifies the clear treating or handling of any particular point, or problem, ſo as to ſhake off the difficulties with which it is embarraſſed: thus we ſay, *ſuch a point was well diſcuſſed*, when it was well treated of and cleared up.

DISCUTIENTS, in medicine, are ſuch remedies, as, by their ſubtilty, diſſolve a ſtagnating or coagulated fluid, and diſſipate the ſame without an external ſolution of continuity.

DISDIACLASTIC crystal, in natural hiſtory, a name given, by Bartholine and ſome others, to the pellucid foſſile ſubſtance, more uſually called, from the place whence it was firſt brought, *Iſland cryſtal;* tho' properly it is no cryſtal at all, but a fine pellucid ſpar, called by Dr Hill, from its ſhape, *parallelopipedum.* See *Island Cryſtal.*

DISDIAPASON, or Bisdiapason, in muſic, a compound concord, deſcribed by F. Parran, in the quadruple ratio of 4 : 1, or 8 : 2.

*Disdiapason Diapente*, a concord in a ſextuple ratio of 1 : 6.

*Disdiapason Semi-Diapente*, a compound concord in the proportion of 16 : 3.

*Disdiapason Ditone*, a compound conſonance in the proportion of 10 : 2.

*Disdiapason Semi-Ditone*, a compound concord in the proportion of 24 : 5.

DISEASE, has been variouſly defined by phyſicians, almoſt every founder of a new ſyſtem having given a definition of *diſeaſe*, differing in ſome reſpects from his predeceſſors. For a particular account of theſe definitions, ſee Medicine.

Of all animals, man is ſubject to the moſt diſeaſes; and of men, the ſtudious and ſpeculative are moſt expoſed thereto. Other animals have their diſeaſes; but they are in ſmall number: nor are plants without them; though their maladies ſcarce exceed half a ſcore. The ancients deified their diſeaſes. Some diſeaſes only impair the uſe of the part immediately affected; as the ophthalmia, gout, &c. Others deſtroy it entirely; as the *gutta ſerena*, palſy, &c. Some affect the whole body; as the fever, apoplexy, epilepſy, &c. Others only impair a part; as the aſthma, colic, dropſy, &c. Some only affect the body; as the gout: others diſturb the mind; as melancholy, delirium, &c. Laſtly, others affect both the body and mind; as the mania, phrenſy, &c.

The colder the country, in general, the fewer and the leſs violent are the diſeaſes. Scheffer tells us that the Laplanders know no ſuch thing as the plague, or fevers of the burning kind, nor are ſubject to half the diſtempers we are. They are robuſt and ſtrong, and live to 80, 90, and many of them to more than 100 years; and at this great age they are not feeble and decrepid as with us; but a man of 90 is able to work or travel as well as a man of 60 with us. They are ſubject, however, to ſome diſeaſes more than other nations: thus they have often diſtempers of the eyes, which is owing to their living in ſmoke, or being blinded by the ſnow. Pleuriſies and inflammations of the lungs are alſo very frequent among them; and the ſmall-pox often rages with great violence. They have one general remedy againſt theſe and all other internal diſeaſes: this is the root of that ſort of moſs, as Scheffer expreſſes it, which they call *jerth*. They make a decoction of this root in the whey of rein-deer milk, and drink very large doſes of it warm, to keep up a breathing ſweat; if they cannot get this, they uſe the ſtalks of angelica boiled in the ſame manner: they have not ſo great an opinion of this as of the other remedy; but the keeping in a ſweat, and drinking plentifully of diluting liquors, may go a great way in the cure of their diſeaſes, whether either the one or the other of the drugs have any virtue or not. They cure pleuriſies by this method in a very few days; and get ſo well through the ſmall-pox with it, that very few die of it.

It has been always obſerved, that people of particular places were peculiarly ſubject to particular diſeaſes, which are owing to their manner of living, or to the air and effluvia of the earth and waters. Hoffman has made ſome curious obſervations on diſeaſes of this kind. He obſerves, that ſwellings of the throat have always been common to the inhabitants of mountainous countries: and the old Roman authors ſay, Who wonders at a ſwelled throat in the Alps? The people of Swiſſerland, Carynthia, Styria, the Hartz foreſt, Tranſylvania, and the inhabitants of Cronſtadt, he obſerves, are all ſubject to this diſeaſe from the ſame cauſe.

The French are peculiarly troubled with fevers, with worms, and with hydroceles and ſarcoceles; and all theſe diſorders ſeem to be owing originally to their eating very large quantities of cheſnuts. The people of our own nation are peculiarly afflicted with hoarſeneſſes, catarrhs, coughs, dyſenteries, conſumptions, and the ſcurvy; and the women with the *fluor albus* or whites; and children with a diſeaſe ſcarce known elſewhere, which we call the *rickets*. In different parts of Italy different diſeaſes reign. At Naples the venereal diſeaſe is more common than in any other part of the world. At Venice, people are peculiarly ſubject to the bleeding piles. At Rome, tertian agues and lethargic diſtempers are moſt common. In Tuſcany, the epilepſy or falling ſickneſs. And in Apulia they are moſt ſubject to burning fevers, pleuriſies, and to that ſort of madneſs which is attributed to the bite of the tarantula, and which, it is ſaid, is only to be cured by muſic. In Spain apoplexies are common, as alſo melancholy, hypochondriacal complaints, and bleeding piles. The Dutch are peculiarly ſubject to the ſcurvy, and to the ſtone in the kidneys. Denmark, Norway, Sweden, Pomerania, and Livonia, are all terribly afflicted with the ſcurvy: and it is remarkable, that in Denmark, Sweden, and Norway, fevers are very common; but in Iceland, Lapland, and Finland, there is ſcarce ever ſuch a diſeaſe met with; though peripneumonies are very common in theſe places, as alſo diſeaſes of the eyes and violent pains of the head. The Ruſſians and Tartars are afflicted with ulcers, made by the cold, of the nature of what we call chilblains, but greatly worſe; and in Poland and Lithuania there reigns a peculiar diſeaſe called the *plica polonica*, ſo terribly painful and offenſive, that ſcarce any thing can be thought of worſe. The people of Hungary are very ſubject to the gout and rheumatiſm: they are more infeſted alſo with lice and fleas than any other people in the world, and they have a peculiar diſeaſe which they call *cremor*. The Germans, in different parts of the empire, are ſubject to different reigning diſeaſes. In Weſtphalia, they are peculiarly troubled with peripneumonies and the itch. In Sileſia, Franconia, Auſtria, and other places thereabout, they are very liable to fevers of the burning kind, to bleedings at the noſe, and other hæmorrhages; and to the gout, inflammations, and conſumptions. In Miſnia they have purple fevers; and the children are peculiarly infeſted with worms. In Greece, Macedonia, and Thrace, there are very few diſeaſes; but what they have are principally burning fevers and phrenzies. At Conſtantinople the plague always rages; and in the Weſt Indian iſlands, malignant fevers, and the moſt terrible colics. Theſe diſeaſes are called *endemic*.

DISEASES *of Horſes*. See FARRIERY.

DISEASES *of Dogs*. See DOGS.

DISEASES *of Plants*. See AGRICULTURE, n° 69, *et ſeq.* and BLIGHT, MILDEW, &c.

DISEMBOGUE. When a ſhip paſſes out of the mouth of ſome great gulf or bay, they call it *diſemboguing*. They ſay alſo of a river, that at ſuch a place, or after it has run ſo many leagues, it diſembogues itſelf into the ſea.

DISFRANCHISING, among civilians, ſignifies the depriving a perſon of the rights and privileges of a free citizen or ſubject.

DISGUISE, a counterfeit habit. Perſons doing unlawful acts in diſguiſe are by our ſtatutes ſometimes ſubjected to great penalties, and even declared felons. Thus by an act, commonly called the *black act*, perſons appearing diſguiſed and armed in a foreſt or grounds incloſed, or hunting deer, or robbing a warren or a fiſh-pond, are declared felons.

DISH, in mining, is a trough made of wood, about 28 inches long, four inches deep, and ſix inches wide; by which all miners meaſure their ore. If any be taken ſelling their ore, not firſt meaſuring it by the bar-maſter's diſh, and paying the king's duty, the ſeller forfeits his ore, and the buyer forfeits for every ſuch offence 40 ſhillings to the lord of the field or farmer.

DISJUNCTIVE, ſomething that ſeparates or disjoins. Thus, *or*, *neither*, &c. which in connecting a diſcourſe yet ſeparates the parts of it, are called *disjunctive conjunctions*.

DISK. See DISC.

DISLOCATION, the putting a bone out of joint by ſome violence, uſually called by the phyſicians *luxation*.

DISMISSION *of a* BILL, in chancery. If the plaintiff does not attend on the day fixed for the hearing, his bill is diſmiſſed with coſts. It may be alſo diſmiſſed for want of proſecution, which is in the nature of a non-ſuit at law, if he ſuffers three terms to elapſe without moving forward in the cauſe.

DISMOUNTING, in the military art, the act of unhorſing. Thus, to diſmount the cavalry, the dragoons, or the like, is to make them alight. To diſmount the cannon, is to break their carriages, wheels, and axletrees, ſo as to render them unfit for ſervice. Horſes are alſo diſmounted when they are rendered unfit for ſervice.

DISPARAGEMENT, in law, is uſed for the matching an heir, &c. in marriage, below his or her degree or condition, or againſt the rules of decency. The word is a compound of the privative particle *dis*, and *par*, "equal."

DISPART, in gunnery, is the ſetting a mark upon the muzzle-ring, or thereabouts, of a piece of ordnance, ſo that a ſight-line taken upon the top of the baſe-ring againſt the touch-hole, by the mark ſet on or near the muzzle, may be parallel to the axis of the concave cylinder. The common way of doing this, is to take the two diameters of the baſe ring, and of the place where the diſpart is to ſtand, and divide the difference between them into two equal parts, one of which will be the length of the diſpart which is ſet on the gun with wax or pitch, or faſtened there with a piece of twine or marlin. By means of an inſtrument it may be done with all poſſible nicety.

DISPATCH, a letter on ſome affair of ſtate, or other buſineſs of importance, ſent with care and expedition, by a courier expreſs. The buſineſs of diſpatches lies on the ſecretaries of ſtate and their clerks. The king gives directions to his miniſters abroad by diſpatches. The word is alſo uſed for the packet or mail containing ſuch letters. The French, during the reign of Louis XIV. had a *conſeil des depeches*, "council of diſpatches," held in the king's preſence, at which the dauphin, the duke of Orleans, the chancellor, and four ſecretaries of ſtate, aſſiſted.

DISPAUPER. A perſon ſuing *in forma pauperis*, is ſaid to be diſpaupered, if, before the ſuit is ended, he has any lands or other eſtate fallen to him, or if he has any thing to make him loſe his privilege. See the article *FORMA Pauperis*.

DISPENSARY, or DISPENSATORY, denotes a book containing the method of preparing the various kinds of medicines uſed in pharmacy. Such are thoſe of Bauderon, Quercetan, Zwelfer, Charas, Bates, Meſue, Salmon, Lemery, Quincy, &c. but the lateſt and moſt eſteemed, beſide the London and Edinburgh Pharmacopœias, is the Edinburgh New Diſpenſatory, being an improvement upon that of Dr Lewis's.

DISPENSARY, or *Diſpenſatory*, is likewiſe a magazine or office for ſelling medicines at prime coſt to the poor. The college of phyſicians maintain three of theſe in London; one at the college itſelf in Warwick-lane; another in St Peter's alley, Cornhill; and a third in St Martin's lane. Diſpenſaries have alſo been eſtabliſhed in ſeveral of the principal towns in Scotland and England; particularly in Edinburgh, Dundee, and Kelſo; as alſo at Newcaſtle upon Tyne.

DISPENSATION, in law, the granting a licenſe of doing ſome certain action that otherwiſe is not permitted.

DISPERSION, in general, ſignifies the ſcattering or diſſipating ſomething. Hence

Dispersion, in optics, the ſame with the divergency of the rays of light.

*Point of Dispersion*, in dioptrics, the point from which refracted rays begin to diverge, where their refraction renders them divergent.

*Dispersion of Inflammation*, in medicine and ſurgery, is the removing the inflammation, and reſtoring the inflamed part to its natural ſtate.

*Dispersion of Mankind*, in the hiſtory of the world, was occaſioned by the confuſion of tongues, and took place in conſequence of the overthrow of Babel at the birth of Peleg; whence he derived his name: and it appears by the account given of his anceſtors, Gen. chap. xi. 10—16, to have happened in the 101ſt year after the flood according to the Hebrew chronology, and by the Samaritan computation in the 401ſt. However, various difficulties have been ſuggeſted by chronologers concerning the true era of this event. Sir John Marſham and others, in order to reconcile the Hebrew and Egyptian chronologies, maintain a diſperſion of mankind before the birth of Peleg. Others, unable to find numbers ſufficient for the plantation of colonies in the ſpace of 101 years, according to the Hebrew computation, fix the diſperſion towards the end of Peleg's life, thus following the computation of the Jews. Petavius aſſigns the 153d year after the flood; Cumberland the 180th; and Uſher, though he generally refers it to the time of Peleg's birth, in one place aſſigns the 131ſt after the flood for this event. Mr Shuckford ſuppoſes the diſperſion to have been gradual, and to have commenced with the ſeparation of ſome companies at the birth of Peleg, and to have been completed 31 years after. According to the calculation of Petavius, the number of inhabitants on the earth at the birth of Peleg amounted to 32,768: Cumberland makes them 30,000: Mr Mede ſtates them at 7000 men, beſides women and children: and Mr Whiſton, who ſuppoſes that mankind now double themſelves in 400 years, and that they doubled themſelves between the deluge and the time of David in 60 years at a medium, when their lives were ſix or ſeven times as long as they have been ſince, by his computation produces about 2389; a number much too inconſiderable for the purpoſes of ſeparating and forming diſtinct nations. This difficulty induced Mr Whiſton to reject the Hebrew and to adopt the Samaritan chronology, as many others have done; which, by allowing an interval of 401 years between the flood and the birth of Peleg, furniſhes, by the laſt mentioned mode of computation, more than 240,000 perſons.

As to the manner of the diſperſion of the poſterity of Noah from the plain of Shinar, it was undoubtedly conducted with the utmoſt regularity and order. The ſacred hiſtorian informs us, that they were divided in their lands; every one according to his tongue, according to his family, and according to his nation, Gen. x. 5, 20, 31: and thus, as Mr Mede obſerves, they were ranged according to their nations, and every nation was ranged by their families; ſo that each nation had a ſeparate lot, and each family in every nation. The following abſtract will ſerve to give a general idea of their reſpective ſettlements: Japhet, Noah's eldeſt ſon, had ſeven ſons; *viz.* Gomer, whoſe deſcendants inhabited thoſe parts of Aſia which lie upon the Ægean Sea and Helleſpont northward, containing Phrygia, Pontus, Bithynia, and a great part of Galatia. The Galatians, according to Joſephus, were called *Gomeræi;* and the Cimmerii, according to Herodotus, occupied this tract of country: and from theſe Gomerians, Cimmerii, or Celts, Mr Camden derives our ancient Britons, who ſtill retain the name *Cymro* or *Cymru*. Magog, the ſecond ſon of Japhet, was probably the father of the Scythians on the eaſt and north-eaſt of the Euxine Sea. Madai planted Media, though Mr Mede aſſigns Macedonia to his ſhare. Javan was the father of the Grecians about Ionia, whoſe country lies along upon the Mediterranean Sea; the radicals of Javan and Ionia being the ſame [illegible]. To Tubal and Meſhech belonged Cappadocia and the country which lies on the borders of the Euxine Sea; and from them, migrating over the Caucaſus, it is ſuppoſed the Ruſſians and Moſcovites are deſcended. And Tiras occupied Thrace. The ſons of Shem were five: Elam, whoſe country lay between the Medes and Meſopotamians, and was called by the Gentile writers *Elymais;* and Joſephus calls the Elamites the founders of the Perſians: Aſhur, who was driven out of Shinar by Nimrod, afterwards ſettled in Aſſyria, and there built Nineveh and other cities: Arphaxad, who gave name to the country which Ptolemy calls *Arraphacitis*, a province of Aſſyria, though Joſephus makes him the father of the Chaldees: Lud, who inhabited and gave name to the country of Lydia about the river Mæander, remarkable for its windings, in Aſia Minor: and Aram, the father of the Syrians. Ham, the youngeſt ſon of Noah, had four ſons; *viz.* Cuſh, whoſe poſterity ſpread into the ſeveral parts of Arabia, over the borders of the land of Edom, into Arabia Felix, up to Midian and Egypt: Mizraim, the father of them who inhabited Egypt and other parts of Africa: Phut, to whom Bochart aſſigns the remaining part of Africa, from the lake Tritonides to the Atlantic Ocean, called *Lybia:* and Canaan, to whom belonged the land of Canaan, whence the Phœnicians derived their origin.

Dr Bryant has advanced a new hypotheſis on this ſubject, and ſupported it with his uſual acuteneſs and learning. He maintains, that the diſperſion as well as the confuſion of tongues was local, and limited to the inhabitants of the province of Babel; that the ſeparation and diſtribution recorded to have taken place in the days of Peleg, Gen. x. 25, 31, 32, which was the reſult of Divine appointment, occaſioned a general migration; and that all the families among the ſons of men were concerned in it. The houſe of Shem, from which the Meſſiah was to ſpring, was particularly regarded in this diſtribution; the portion of his children was near the place of ſeparation; they in general had Aſia to their lot; as Japhet had Europe, and Ham the large continent of Africa. But the ſons of Chus would not ſubmit to the divine diſpenſation; they went off under the conduct of Nimrod, and ſeem to have been for a long time in a roving ſtate. However, at laſt they arrived at the plains of Shinar; and having ejected Aſhur and his ſons, who were placed there by Divine appointment, ſeized his dominions, and laid there the foundation of a great monarchy. But afterwards fearing leſt they ſhould be divided and ſcattered abroad, they built the tower of Babel as a landmark to which they might repair; and probably to anſwer the purpoſes of an idolatrous temple, or high altar, dedicated to the hoſt of heaven, from which they were never long to be abſent. They only, *viz.* the ſons of Chus or the Cuthites, and their aſſociates from other families, who had been guilty of rebellion againſt divine authority, and of wicked ambition and tyranny, were puniſhed with the judgment of confounded ſpeech through a failure in labial utterance, and of the diſperſion recorded in Gen. x. 8, 9: in conſequence of which they were ſcattered abroad from this city and tower, without any certain place of deſtination. The Cuthites invaded Egypt or the land of Mizraim in its infant ſtate, ſeized the whole country, and held it for ſome ages in ſubjection; and they extended likewiſe to the Indies and Ganges, and ſtill farther into China and Japan. From them the province of Cuſhan or Goſhen in Egypt derived its name. Here they obtained the appellation of *royal ſhepherds;* and when they were by force driven out of the country, after having been in poſſeſſion of it for 260 or 280 years, the land which they had been obliged to quit was given to the Iſraelites, who were alſo denominated *ſhepherds*, but ſhould not be confounded with the former or the antecedent inhabitants of Goſhen.

DISPLAYED, in heraldry, is underſtood of the poſition of an eagle, or any other bird, when it is erect, with its wings expanded or ſpread forth.

DISPONDEE, in the Greek and Latin poetry, a double ſpondee or foot, conſiſting of four long ſyllables; as māēcēnātēs, cōnclūdēntēs.

DISPOSITION, in Scots law, is that deed or writing which contains the ſeale or grant of any ſubject: when applied to heritable ſubjects, it in ſome caſes gets the name of *charter*, which differs from a diſpoſition in nothing elſe than a few immaterial forms.

Disposition, in architecture, the juſt placing the ſeveral parts of an edifice according to their nature and office. See Architecture, n° 31, &c.

Disposition, in oratory. See Oratory, Part I.

Disposition, in painting. See Painting.

Disposition, in human nature.—In every man there is ſomething original, that ſerves to diſtinguiſh him from others, that tends to form a character, and to make him meek or fiery, candid or deceitful, reſolute or timorous, cheerful or moroſe. This original bent, termed *diſpoſition*, muſt be diſtinguiſhed from a *principle:* the latter, ſignifying a law of human nature, makes part of the common nature of man; the former makes part of the nature of this or that man. *Propenſity* is a name common to both; for it ſignifies a principle as well as a diſpoſition.

DISQUISITION (from *dis* and *quæro* "I inquire"), an inquiry into the nature, kinds, and circumſtances of any problem, queſtion, or topic; in order to gain a right notion of it, and to diſcourſe clearly about it.

DISSECTION, in anatomy, the cutting up a body with a view of examining the ſtructure and uſe of the parts. See Anatomy.

Le Gendre obſerves, that the diſſection of a human body, even dead, was held a ſacrilege till the time of Francis I. And the ſame author aſſures us, he has ſeen a conſultation held by the divines of Salamanca, at the requeſt of Charles V. to ſettle the queſtion whether or no it were lawful in point of conſcience to diſſect a human body in order to learn the ſtructure thereof.

DISSEISIN, in law, an unlawful diſpoſſeſſing a perſon of his lands or tenements.

DISSEPIMENTUM, in botany, the name by which Linnæus denominates the partitions which in dry ſeed-veſſels, as capſules and pods (ſiliqua), divide the fruit internally into cells.

DISSENTERS, ſeparatiſts from the ſervice and worſhip of any eſtabliſhed church.

DISSIDENTS, a denomination applied in Poland to thoſe of the Lutheran, Calviniſtic, and Greek profeſſion. The king of Poland engages by the *pacta conventa* to tolerate them in the free exerciſe of their religion, but they have often had reaſon to complain of the violation of theſe promiſes. See *(Hiſtory of)* Poland.

DISSIMILITUDE, unlikeneſs or want of ſimilitude. See the article Resemblance *and diſſimilitude.*

DISSIMULATION, in morals, the act of diſſembling, by fallacious appearances, or falſe pretenſions.

Good princes regard diſſimulation as a neceſſary vice; but tyrants conſider it as a virtue.

It is apparent that ſecrecy is often neceſſary, to oppoſe thoſe who may be willing to circumvent our lawful intentions. But the neceſſity of precaution would become very rare, were no enterprizes to be formed, but ſuch as could be avowed openly. The frankneſs with which we could then act, would engage people in our intereſts. Marſhal Biron would have ſaved his life, by dealing ingenuouſly with Henry IV.

With reſpect to diſſimulation, three things are to be obſerved; 1. That the characters of thoſe are not to be eſteemed, who are reſerved and cautious without diſtinction. 2. Not to make ſecrets of unimportant matters. 3. To conduct ourſelves in ſuch manner, as to have as few ſecrets as poſſible.

DISSIPATION, in phyſics, an inſenſible loſs or conſumption of the minute parts of the body; or that flux whereby they fly off, and are loſt.

*Circle of* Dissipation, in optics, is uſed for that circular ſpace upon the retina, which is taken up by one of the extreme pencils or rays iſſuing from an object.

DISSOLVENT, in general, whatever diſſolves or reduces a ſolid body into ſuch minute parts as to be ſuſtained in a fluid.

The principal diſſolvents for metals are aqua-regia and aqua-fortis; for ſalts, earths, and gums, water; for coral, and other alkaline ſubſtances, diſtilled vinegar or ſpirits of wine. Diſſolvents are the ſame with what the chemiſts call *menſtruums*. See the article Menstruum.

*Univerſal Diſſolvent.* See the article ALKAHEST.

DISSOLUTION, in phyſics: a diſcontinuation, or analyſis, of the ſtructure of a mixed body; whereby, what was one, and contiguous, is divided into little parts, either homogeneous or heterogeneous.

Diſſolution, then, is a general name for all reductions of concrete bodies into their ſmalleſt parts, without any regard either to ſolidity or fluidity: though in the uſual acceptation of the word among authors, it is reſtrained to the reduction of ſolid bodies into a ſtate of fluidity; which is more properly expreſſed by *ſolution*, as a branch of *diſſolution*.

According to the opinion of Fr. Tertius de Lanis, Boerhaave, and ſome other learned men, the power or faculty of diſſolving is lodged in fire alone. See FIRE and HEAT.

According to this hypotheſis, other fluids commonly ſuppoſed diſſolvents, only produce their effect by means of the fiery ſpicula they abound with; and even air, which is judged a powerful menſtruum, owes all its force to the rays of light diffuſed therein.

Sir Iſaac Newton accounts for all diſſolutions, and the ſeveral phenomena thereof, from the great principle of attraction; and, in effect, the phenomena of diſſolution furniſh a great part of the arguments and conſiderations whereby he proves the reality of that principle. The following is a ſpecimen of that great author's way of philoſophiſing on the ſubject of diſſolution.

"When ſalt of tartar diſſolves by lying in a moiſt place, is not this done by an attraction between the particles of the ſalt of tartar and thoſe of the water which float in the air in form of vapours? and why does not common ſalt, or ſalt-petre, or vitriol, do the like, but for want of ſuch an attraction? And when aqua-fortis, or ſpirit of vitriol, poured on ſteel-filings, diſſolves the filings with a great heat and ebullition; is not this heat and ebullition effected by a violent motion of the parts? and does not that motion argue, that the acid parts of the liquor ruſh towards the parts of the metal with violence, and run forcibly into its pores; till, getting between the utmoſt particles and the main maſs of metal, they looſen them therefrom, and ſet them at liberty to float off into the water? When a ſolution of iron in aqua-fortis diſſolves lapis calaminaris, and lets go the iron; or a ſolution of copper diſſolves iron immerſed in it, and lets go the copper; or a ſolution of mercury in aqua-fortis poured on iron, copper, tin, or lead, diſſolves the metal, and lets go the mercury; does not this argue, that the acid particles of the aqua-fortis are attracted more ſtrongly by the lapis calaminaris than by iron; by iron than by copper; by copper than by ſilver; and by iron, copper, tin, and lead, than by mercury? And is it not for the ſame reaſon, that iron requires more aqua-fortis to diſſolve it than copper, and copper more than the other metals; and that of all metals iron is diſſolved moſt eaſily, and is moſt apt to ruſt; and next after iron, copper? When aqua-fortis diſſolves ſilver, and not gold; and aqua-regia diſſolves gold, and not ſilver; may it not be ſaid, that aqua-fortis is ſubtile enough to penetrate the pores of gold as well as of ſilver, but wants the attractive force to give it entrance; and the ſame of aqua-regia and ſilver? And when metals are diſſolved in acid menſtruums, and the acids in conjunction with the metal act after a different manner, ſo as that the taſte of the compound is milder than that of the ſimples and ſometimes a ſweet one; is it not becauſe the acids adhere to the metallic particles, and thereby loſe much of their activity? And if the acid be in too ſmall a proportion to make the compound diſſoluble in water; will it not, by adhering ſtrongly to the metal, become unactive, and loſe its taſte, and the compound become a taſteleſs earth? for ſuch things as are not diſſoluble by the moiſture of the tongue are inſipid."

Dr Freind gives us a mechanical account of diſſolution, in the inſtance of ſalt diſſolved in water, which is the moſt ſimple operation that falls under this head. This motion he aſcribes to that attractive force, which is ſo very extenſive in natural philoſophy, that there is no kind of matter but what is under its influence. It may be obſerved, ſays he, that the corpuſcles of ſalts, which are the moſt ſimple of any, are withal very minute, and for their bulk very ſolid; and therefore exert a very ſtrong attractive force, which, *cæteris paribus*, is proportional to the quantity of matter. Hence it comes to paſs, that the particles of water are more ſtrongly attracted by the ſaline particles than they are by one another: the particles of water, therefore, cohering but looſely, and being eaſily moveable, approach the corpuſcles of ſalts, and run, as it were, into their embraces: and the motion of them is quicker or ſlower, according to their leſs or greater diſtances; the attractive force in all bodies being ſtrongeſt, at the point of contact. Therefore, if ſalt be thrown into the middle of a diſh full of water, we ſhall find the aqueous particles which are in the middle of the diſh ſharp and pungent to the taſte, but the water upon the ſides of the veſſel almoſt inſipid; ſo that, when ſuch a motion once ariſes, the aqueous particles are carried with an equal force towards the ſalts, and the moment of them is to be eſtimated from the ratio of their weight and celerity conjunctly. By the force of this impulſe, they open to themſelves a paſſage into the pores of the ſalts, which are very numerous; and at length ſo break and divide their texture, that all coheſion of their parts is deſtroyed: hereupon, being ſeparated, and removed to a convenient diſtance from one another, they are diſperſed, and float here and there about the water.

The ſimple diſſolution of ſaline ſubſtances of every kind in water, may indeed be plauſibly enough explained on the hypotheſis of attraction; but where the diſſolution is attended with heat, the emiſſion of vapour, &c. it ſeems neceſſary to ſeek for ſome other principle than mere attraction to ſolve theſe phenomena. When diluted oil of vitriol, for inſtance, is poured upon iron-filings, a great quantity of vapour ariſes, which, if it was attempted to be confined, would certainly break the containing veſſel.—It is impoſſible to imagine any connection between attraction and the emiſſion of a vapour; and what is ſtill more unaccountable, this vapour is inflammable, though neither the oil of vitriol nor the iron are ſo by themſelves. Another very ſtrong objection againſt the hypotheſis of attraction may be derived from the phenomena of metallic diſſolutions in general; for they do not diſſolve completely in acids, as ſalts do in water. By diſſolution they are always decompoſed, and cannot be recovered in their proper form without a good deal of trouble.

trouble. One metal, indeed, will very often precipitate another from an acid in its metalline form; but this is attended with the decompoſition of the ſecond metal; ſo that this can by no means be reckoned a fair experiment. But, whatever other method is uſed, the diſſolved metal is always recovered in form of an earthy powder, that we could ſcarcely imagine capable of ever becoming malleable, and aſſuming the ſplendid appearance of a metal. Now, if there was a ſtrong attraction between this and the acid, we might very juſtly conjecture, that the diſſolution happened by means of that attraction; but ſo far from this, after a metal has been diſſolved by any acid, and the calx has been ſeparated from it, it is always difficult, and very often impoſſible, to procure a diſſolution of the calx in the ſame acid. The action of the acid in this caſe ſeems not unlike that of fire upon wood or any other inflammable ſubſtance. Dry wood, thrown into the fire, burns and flames with great violence; but the ſame wood reduced to aſhes, inſtead of burning, extinguiſhes fire already kindled. In like manner, a piece of clear metal thrown into an acid, diſſolves with great violence: but the ſame metal, deprived of its phlogiſtic principle, and reduced to a calx, cannot be acted upon by acids, in whatever manner they are applied; at leaſt, not without the greateſt difficulty; and the more perfect the calx is, *i. e.* the more completely it is deprived of its inflammable principle, the greater the difficulty is of combining it afterwards with an acid.

Another thing in which the diſſolution of metals by an acid reſembles the burning of combuſtibles by fire is, that in both caſes there is a ſeparation of the principle of inflammability. In the caſe of oil of vitriol and iron-filings, this is exceedingly obvious; for there the vapour which ariſes from the mixture takes fire, and explodes with great vehemence. In all other caſes it is very eaſily proved; for the calx is always capable of being revived into metal by the addition of any ſubſtance containing phlogiſton. The calces prepared by fire, and by precipitation from acids, alſo reſemble one another ſo much, that in many caſes they are ſcarce to be diſtinguiſhed.

Theſe conſiderations ſeem to favour the hypotheſis of Dr Boerhaave; and much more does the following, namely, that almoſt all metallic ſolutions produce ſome degree of ſenſible heat. In ſome metals this is very conſiderable; but the greateſt heat producible by an aqueous ſolution of any ſubſtance is by diſſolving quicklime in the nitrous acid. The heat here greatly exceeds that of boiling water. In ſome diſſolutions of inflammable matters by a mixture of the vitriolic and nitrous acids, the heat is ſo great, that the whole mixture takes fire almoſt inſtantaneouſly. Hence the Boerhaavians think they have ſufficient grounds to conclude, that fire alone is the agent by which all diſſolutions are performed.

Theſe appearances have alſo been explained on the principles of attraction; and it has been ſaid, that the heat, &c. were owing to nothing but the violent action of the particles of the acid and metal upon each other. But the late diſcoveries made by Dr Black, with regard to heat, ſhow, that it is capable of remaining concealed in ſubſtances for any length of time, and afterwards breaking out in its proper form. It is probable, therefore, that the heat produced in theſe diſſolutions is no other than what exiſted before, either in the acid or in the metal. But for a full diſcuſſion of this ſubject ſee the articles Cold, Congelation, Evaporation, Fire, Heat, &c.

DISSONANCE, in muſic. See Discord.

DISSYLLABLE, among grammarians, a word conſiſting only of two ſyllables: ſuch are nature, ſcience, &c.

DISTAFF, an inſtrument about which flax is tied in order to be ſpun.

DISTANCE, in general, an internal between two things, either with regard to time or place. See Metaphysics.

*Acceſſible Distances*, in geometry, are ſuch as may be meaſured by the chain, &c. See Geometry.

*Inacceſſible Distances*, are ſuch as cannot be meaſured by the chain, &c. by reaſon of ſome river, or the like, &c. which obſtructs our paſſing from one object to another. See Geometry.

Distance, in aſtronomy. The diſtance of the ſun, planets, and comets, is found only from their parallax, as it cannot be found either by eclipſes or their different phaſes: for from the theory of the motions of the earth and planets we know, at any time, the proportion of the diſtances of the ſun and planets from us; and the horizontal parallaxes are in a reciprocal proportion to theſe diſtances. See Astronomy.

DISTASTE properly ſignifies an averſion or diſlike to certain foods; and may be either conſtitutional, or owing to ſome diſorder of the ſtomach.

DISTEMPER, among phyſicians, the ſame with Disease.

Distemper, in painting, a term uſed for the working up of colours with ſomething beſides water or oil. If the colours are prepared with water, that kind of painting is called *limning*; and if with oil, it is called *painting in oil*, and ſimply *painting*. If the colours are mixed with ſize, whites of eggs, or any ſuch proper glutinous or unctuous matter, and not with oil, then they ſay it is done in *diſtemper*.

DISTENSION, in general, ſignifies the ſtretching or extending a thing to its full length or breadth.

DISTICH, a couplet of verſes making a complete ſenſe. Thus hexameter and pentameter verſes are diſpoſed in diſtichs. There are excellent morals in Cato's diſtichs.

DISTICHIASIS, in ſurgery, a diſeaſe of the eyelids, when under the ordinary eye-laſhes there grows another extraordinary row of hair, which frequently eradicates the former, and, pricking the membrane of the eye, excites pain, and brings on a defluxion.—It is cured by pulling out the ſecond row of hairs with nippers, and cauterizing the pores out of which they iſſued.

DISTILLATION. See Chemistry, *Index*.

The objects of diſtillation, conſidered as a trade diſtinct from the other branches of chemiſtry, are chiefly ſpiritous liquors, and thoſe waters impregnated with the eſſential oil of plants, commonly called *ſimple diſtilled* waters. The diſtilling compound ſpirits and waters is reckoned a different branch of buſineſs, and they who deal in that way are commonly called *rectifiers*.

1
Difference between diſtillers and rectifiers.

This difference, however, though it exiſts among commercial people, is not at all founded in the nature of the thing; compound ſpirits being made, and ſimple ſpirits being rectified, by the very ſame operations by which they are at firſt diſtilled, or at leaſt with very trifling alterations.

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The great object with every diſtiller ought to be, to procure a ſpirit perfectly flavourleſs, or at leaſt as well freed from any particular flavour as may be; and in this country the procuring of ſuch a ſpirit is no eaſy matter. The only materials for diſtillation that have been uſed in large quantity, are malt and molaſſes or treacle. Both of theſe, eſpecially the firſt, abound with an oily matter, which, riſing along with the ſpirit, communicates a diſagreeable flavour to it, and from which it can ſcarce be freed afterwards by any means whatever.—Some experiments have been made upon carrots, as a ſubject for the diſtillers: but theſe are not as yet ſufficiently deciſive; nor is it probable, that a ſpirit drawn from carrots would be at all devoid of flavour, more than one drawn from malt.—To diſſipate the eſſential oil which gives the diſagreeable flavour to malt ſpirits, it has been propoſed to inſpiſſate the wort into a rob, or thin extract like a ſyrup; afterwards to thin it with water, and ferment it in the uſual manner. This certainly promiſes great ſucceſs; there is no ſubject we know of that is poſſeſſed of any kind of eſſential oil, but what will part with it by diſtillation or by long boiling. The inſpiſſating of the wort, however, does not ſeem to be either neceſſary or ſafe to be attempted; for, in this caſe, there is great danger of its contracting an empyreuma, which never could be remedied. The quantity loſt by evaporation, therefore, might be occaſionally added, with an equal certainty of diſſipating the obnoxious oil. Whether the yield of ſpirit would be as great in this caſe as in the other, is a queſtion that can by no means be diſcuſſed without further experiments.

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According to a theory adopted by ſome diſtillers, namely, that eſſential oils are convertible into ardent ſpirits; and that the more oily any ſubject is, the greater quantity of ſpirit is obtainable from it; the practice of diſſipating the oil before fermentation muſt certainly be a loſs. But we are too little acquainted with the compoſition of vinous ſpirits, to have any juſt foundation for adopting ſuch theories. Beſides, it is certain, that the quantity of ardent ſpirit producible from any ſubſtance, malt for inſtance, very greatly exceeds the quantity of eſſential oil which can by any means be obtained from the ſame; nor do we find that thoſe ſubſtances, which abound moſt in eſſential oil, yield the greateſt quantity of ſpirits. So far from this, fine ſugar, which contains little or no eſſential oil, yields a great deal of ardent ſpirit.

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Previous to the operation of diſtilling, thoſe of brewing and fermentation are neceſſary: but as theſe are fully treated of under the article Brewing, we ſhall here only obſerve, that unleſs the boiling of the wort, before fermentation, is found to diſſipate the eſſential oil, ſo as to take away the flavour of the malt, there is no neceſſity for being at the trouble of that operation. The wort may be immediately cooled and fermented.—The fermentation ought always to be carried on as ſlowly as poſſible, and performed in veſſels cloſely ſtopped; only having at the bung a valve preſſed down by a ſpring, which will yield with leſs force than is ſufficient to burſt the veſſel. It ſhould even be ſuffered to remain till it has become perfectly fine and tranſparent; as by this means the ſpirit will not only be ſuperior in quantity, but alſo in fragrance, pungency, and vinoſity, to that commonly produced.

5
For diſtillation.

With regard to performing the operation of diſtilling, there is only one general rule that can be given, namely, to let the heat, in all caſes, be as gentle as poſſible. Accidents will be effectually prevented by having the worm of a proper wideneſs, and by rectifying the ſpirits in a water-bath; which, if ſufficiently large, will perform the operation with all the diſpatch requiſite for the moſt extenſive buſineſs.—The veſſel in which the rectification is performed, ought to be covered with water up to the neck, and to be loaded with lead at the bottom, ſo that it may ſink in the water. Thus the operation will go on as quickly as if it was on an open fire, and without the leaſt danger of a miſcarriage; nor will it ever be neceſſary to make the water in the bath come to a boiling heat.

6
For rectification.

As the end of rectification is to make the ſpirit *clean* as well as *ſtrong*, or to deprive it of the eſſential oil as well as the aqueous part, it will be proper to have regard to this even in the firſt diſtillation. For this purpoſe, the ſpirit, as it firſt comes over, ſhould be received into a quantity of cold water; as by this means the connection betwixt it and the oily matter will be conſiderably leſſened. For the ſame reaſon, after it has been once rectified in the water-bath, it ſhould be again mixed with an equal quantity of water, and diſtilled a ſecond time. Thus the ſpirit will be freed from moſt of the oily matter, even though it hath been very much impregnated with it at firſt. It is neceſſary to obſerve, however, that by uſing ſuch a quantity of water, a conſiderable part of the water will be left in the reſiduum of each rectification. All theſe reſiduums, therefore, muſt be mixed together, and diſtilled on an open fire, with a briſk heat, that the remainder of the ſpirit may be got out.

After the ſpirit has been diſtilled once or twice in this manner from water, it may be diſtilled in a water-bath without any addition; and this laſt rectification will free it from moſt of the water it contains. But if it is required to be highly dephlegmated, a quantity of pure and dry ſalt of tartar muſt be added. The attraction betwixt this ſalt and water is greater than that betwixt water and ſpirit of wine. The ſalt therefore imbibes the water contained in the ſpirit, and ſinks with it to the bottom. The ſpirit, by a ſingle diſtillation, may then be rendered perfectly free from water; but there is great danger of ſome of the alkaline ſalt riſing along with it, and impregnating it with what is called an *urinous flavour*. When this once happens, it is impoſſible to be remedied; and the only way to prevent it is, to make the heat with which the ſpirit is diſtilled as gentle as poſſible. It hath been propoſed, indeed, to prevent the riſing of any thing alkaline, by the admixture of ſome calcined vitriol, ſal catharticus amarus, or other imperfect neutral ſalt; but this can ſcarce be ſuppoſed to anſwer any good purpoſe, as the alkali unites itſelf with the oily matter of the ſpirit, and forms a kind of ſaponaceous compound, which is not ſo eaſily affected by the acid of the vitriol or other ſalt, eſpecially as theſe ſalts will not diſſolve in the ſpirit itſelf.

7
Of imitating foreign ſpirits.

8
Method of making brandies in France.

One very great deſideratum among the diſtillers of this country is, a method of imitating the foreign ſpirits, brandy, rum, gin, &c. to a tolerable degree of perfection; and notwithſtanding the many attempts that are daily made for this purpoſe, the ſucceſs in general hath been but very indifferent. On this ſubject, Mr Cooper hath the following obſervations, in his Complete Syſtem of Diſtillation; which, as they are applicable to all other ſpirits as well as brandy, we ſhall here tranſcribe.—“ The general method of diſtilling brandies in France need not be formally deſcribed, as it differs in nothing from that practiſed here in working from malt-waſh or molaſſes; nor are they in the leaſt more cleanly or exact in the operation. They only obſerve more particularly to throw in a little of the natural ley into the ſtill along with the wine, as finding this gives their ſpirit the flavour for which it is generally admired abroad.—But, though brandy is extracted from wine, experience tells us that there is a great difference in the grapes from which the wine is made. Every ſoil, every climate, every kind of grapes, varies with regard to the quantity and quality of the ſpirits extracted from them. There are ſome grapes which are only fit for eating; others for drying, as thoſe of Damaſcus, Corinth, Provence, and Avignon, but not fit to make wine.—Some wines are very proper for diſtillation, and others much leſs ſo. The wines of Languedoc and Provence afford a great deal of brandy by diſtillation, when the operation is performed on them in their full ſtrength. The Orleans wines, and thoſe of Blois, afford yet more: but the beſt are thoſe of the territories of Cogniac and Andaye; which are, however, in the number of thoſe the leaſt drunk in France. Whereas thoſe of Burgundy and Champagne, though of a very fine flavour, are improper, becauſe they yield but very little in diſtillation.

“ It muſt alſo be farther obſerved, that all the wines for diſtillation, as thoſe of Spain, the Canaries, of Alicant, of Cyprus, of St Peres, of Toquet, of Grave, of Hungary, and others of the ſame kind, yield very little brandy by diſtillation; and conſequently would coſt the diſtiller conſiderably more than he could ſell it for. What is drawn from them is indeed very good, always retaining the ſaccharine quality and rich flavour of the wine from whence it is drawn; but as it grows old, this flavour often becomes aromatic, and is not agreeable to all palates.

“ Hence we ſee that brandies always differ according as they are extracted from different ſpecies of grapes. Nor would there be ſo great a ſimilarity as there is between the different kinds of French brandies, were the ſtrongeſt wines uſed for this purpoſe: but this is rarely the caſe; the weakeſt and loweſt flavoured wines only are diſtilled for their ſpirit, or ſuch as prove abſolutely unfit for any other uſe.

“ A large quantity of brandy is diſtilled in France during the time of the vintage; for all thoſe poor grapes that prove unfit for wine, are uſually firſt gathered, preſſed, their juice fermented, and directly diſtilled. This rids their hands of their poor wines at once, and leaves their caſks empty for the reception of better. It is a general rule with them not to diſtil wine that will fetch any price as wine; for, in this ſtate, the profits upon them are vaſtly greater than when reduced to brandies. This large ſtock of ſmall wines, with which they are almoſt over-run in France, ſufficiently accounts for their making ſuch vaſt quantities of brandy in that country, more than in others which lie in warmer climates and are much better adapted to the production of grapes.—Nor is this the only fund of their brandies: for all the wine that turns eager, is alſo condemned to the ſtill; and, in ſhort, all that they can neither export nor conſume at home, which amounts to a large quantity; ſince much of the wine laid in for their family proviſion is ſo poor as not to keep during the time of ſpending.

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“ Hence many of our Engliſh ſpirits, with proper management, are convertible into brandies that ſhall hardly be diſtinguiſhed from the foreign in many reſpects, provided the operation be neatly performed.

“ The common method of rectifying ſpirits from alkaline ſalts, deſtroys their vinoſity, and in its ſtead introduces an urinous or lixivious taſte. But as it is abſolutely neceſſary to reſtore, or at leaſt to ſubſtitute in its room, ſome degree of vinoſity, ſeveral methods have been propoſed, and a multitude of experiments performed, in order to diſcover this great deſideratum. But none has ſucceeded equal to the ſpirit of nitre; and accordingly this ſpirit, either ſtrong or dulcified, has been uſed by moſt diſtillers to give an agreeable vinoſity to their ſpirits. Several difficulties, however, occur in the method of uſing it; the principal of which is, its being apt to quit the liquor in a ſhort time, and conſequently depriving the liquor of that vinoſity it was intended to give. In order to remove this difficulty, and prevent the vinoſity from quitting the goods, the dulcified ſpirit of nitre, which is much better than the ſtrong ſpirit, ſhould be prepared by a previous digeſtion, continued for ſome time, with alcohol; the longer the digeſtion is continued, the more intimately will they be blended, and the compound rendered the milder and ſofter.

After a proper digeſtion, the dulcified ſpirit ſhould be mixed with the brandy, by which the vinoſity will be intimately blended with the goods, and not diſpoſed to fly off for a very conſiderable time.—No general rule can be given for the quantity of this mineral acid requiſite to be employed; becauſe different proportions of it are neceſſary in different ſpirits. It ſhould, however, be carefully attended to, that though a ſmall quantity of it will undoubtedly give an agreeable vinoſity reſembling that naturally found in the fine ſubtile ſpirits drawn from wines, yet an over large doſe of it will not only cauſe a diſagreeable flavour, but alſo render the whole deſign abortive, by diſcovering the impoſition. Thoſe, therefore, who endeavour to cover a foul taſte in goods by large doſes of dulcified ſpirit of nitre, will find themſelves deceived.

“ But the beſt, and indeed the only method of imitating French brandies to perfection, is by an eſſential oil of wine; this being the very thing that gives the French brandies their flavour. It muſt, however, be remembered, that, in order to uſe even this ingredient to advantage, a pure taſteleſs ſpirit muſt firſt be procured; for it is ridiculous to expect that this eſſential oil ſhould be able to give the agreeable flavour of French brandies to our fulſome malt ſpirit, already loaded with its own nauſeous oil, or ſtrongly impregnated with a lixivious taſte from the alkaline ſalts uſed in in rectification. How a pure inſipid ſpirit may be obtained, has already been conſidered; it only therefore remains to ſhow the method of procuring this eſſential oil of wine, which is this:

“ Take ſome cakes of dry wine-lees, ſuch as are uſed by our hatters, diſſolve them in ſix or eight times their weight of water, diſtil the liquor with a ſlow fire, and ſeparate the oil with a ſeparating glaſs; reſerving for the niceſt uſes only that which comes over firſt, the ſucceeding oil being coarſer and more reſinous.—Having procured this fine oil of wine, it may be mixed into a quinteſſence with pure alcohol; by which means it may be preſerved a long time fully poſſeſſed of all its flavour and virtues; but, without ſuch management, it will ſoon grow reſinous and rancid.

“ When a fine eſſential oil of wine is thus procured, and alſo a pure and inſipid ſpirit, French brandies may be imitated to perfection, with regard to the flavour. It muſt, however, be remembered, and carefully adverted to, that the eſſential oil be drawn from the ſame kind of lees as the brandy to be imitated was procured from; we mean, in order to imitate Coniac brandy, it will be neceſſary to diſtil the eſſential oil from Coniac lees; and the ſame for any other kind of brandy. For, as different brandies have different flavours, and as theſe flavours are entirely owing to the eſſential oil of the grape, it would be prepoſterous to endeavour to imitate the flavour of Coniac brandy with an eſſential oil procured from the lees of Bourdeaux wine.—When the flavour of the brandy is well imitated by a proper doſe of the eſſential oil, and the whole reduced into one ſimple and homogeneous fluid, other difficulties are ſtill behind: The flavour, though the eſſential part, is not, however, the only one; the colour, the proof, and the ſoftneſs, muſt alſo be regarded, before a ſpirit that perfectly reſembles brandy can be procured. With regard to the proof, it may be eaſily hit, by uſing a ſpirit rectified above proof; which, after being intimately mixed with the eſſential oil of wine, may be let down to a proper ſtandard with fair water. And the ſoftneſs may, in a great meaſure, be obtained by diſtilling and rectifying the ſpirit with a gentle fire; and what is wanting of this criterion in the liquor when firſt made, will be ſupplied by time: for it muſt be remembered, that it is time alone that gives this property to French brandies; they being at firſt acrid, foul, and fiery. But, with regard to the colour, a particular method is required to imitate it to perfection.

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“ The art of colouring ſpirits owes its riſe to obſervations on foreign brandies. A piece of French brandy that has acquired by age a great degree of ſoftneſs and ripeneſs, is obſerved at the ſame time to have acquired a yellowiſh brown colour; and hence our diſtillers have endeavoured to imitate this colour in ſuch ſpirits as are intended to paſs for French brandy. And in order to this, a great variety of experiments have been made on different ſubſtances. But in order to know a direct and ſure method of imitating this colour to perfection, it is neceſſary we ſhould be informed whence the French brandies themſelves acquire their colour. This diſcovery is very eaſily made. The common experiment of trying whether brandy will turn blackiſh with a ſolution of iron, ſhows that the colour is owing to ſome of the reſinous matter of the oak-caſk diſſolved in the ſpirit. There can be no difficulty, therefore, in imitating this colour to perfection. A ſmall quantity of the extract of oak, or the ſhavings of that wood, properly digeſted, will furniſh us with a tincture capable of giving the ſpirit any degree of colour required. But it muſt be remembered, that as the tincture is extracted from the caſk by brandy, that is, alcohol and water, it is neceſſary to uſe both in extracting the tincture; for each of theſe diſſolves different parts of the wood. Let, therefore, a ſufficient quantity of oak ſhavings be digeſted in ſtrong ſpirit of wine, and alſo at the ſame time other oak-ſhavings be digeſted in water; and when the liquors have acquired a ſtrong tincture from the oak, let both be poured off from the ſhavings into different veſſels, and both placed over a gentle fire till reduced to the conſiſtence of treacle. In this condition let the two extracts be intimately mixed together; which may be effectually done by adding a ſmall quantity of loaf-ſugar, in fine powder, and rubbing the whole well together. By this means a liquid eſſential extract of oak will be procured, and always ready to be uſed as occaſion ſhall require.

“ There are other methods in uſe for colouring brandies; but the beſt, beſides the extract of oak above mentioned, are treacle and burnt ſugar. The treacle gives the ſpirit a fine colour, nearly reſembling that of French brandy; but as its colour is dilute, a large quantity muſt be uſed: this is not, however, attended with any bad conſequences; for notwithſtanding the ſpirit is really weakened by this addition, yet the bubble proof, the general criterion of ſpirits, is greatly mended by the tenacity imparted to the liquor by the treacle. The ſpirit alſo acquires from the mixture a ſweetiſh or luſcious taſte, and a fullneſs in the mouth; both which properties render it very agreeable to the palates of the common people, who are in fact the principal conſumers of theſe ſpirits. A much ſmaller quantity of burnt ſugar than of treacle will be ſufficient for colouring the ſame quantity of ſpirits: the taſte is alſo very different; for inſtead of the ſweetneſs imparted by the treacle, the ſpirit acquires from the burnt ſugar an agreeable bitterneſs, and by that means recommends itſelf to nicer palates, which are offended with a luſcious ſpirit. The burnt ſugar is prepared by diſſolving a proper quantity of ſugar in a little water, and ſcorching it over the fire till it acquires a black colour. Either treacle or burnt ſugar will nearly imitate the genuine colour of old French brandy; but neither of them will ſucceed when put to the teſt of the vitriolic ſolution.

“ The ſpirit diſtilled from molaſſes or treacle is very clean or pure. It is made from common treacle diſſolved in water, and fermented in the ſame manner as the waſh for the common malt ſpirit. But if ſome particular art is not uſed in diſtilling this ſpirit, it will not prove ſo vinous as malt ſpirit, but more flat and leſs pungent and acid, though otherwiſe much cleaner taſted, as its eſſential oil is of a much leſs offenſive flavour. Therefore, if good freſh wine lees, abounding in tartar, be added and duly fermented with the molaſſes, the ſpirit will acquire a much greater vinoſity and briſkneſs, and approach much nearer to the nature of foreign ſpirits. Where the molaſſes ſpirit is brought to the common proof-ſtrength, if it is found not to have a ſufficient vinoſity, it will be very proper to add ſome good dulcified ſpirit of nitre; and if the ſpirit be clean worked, it may, by this addition only, be made to paſs on ordinary judges for French brandy. Great quantities of this ſpirit are uſed in adulterating foreign brandy, rum, and arrack. Much of it is alſo uſed alone in making cherry-brandy and other drams by infuſion; in all which many, and perhaps with juſtice, prefer it to foreign brandies. Molaſſes, like all other ſpirits, is entirely colourleſs when firſt extracted; but diſtillers always give it as nearly as poſſible the colour of foreign ſpirits."

11 Rum how imitated.

If theſe principles hold good, the imitation of foreign ſpirits of all kinds muſt be an eaſy matter. It will only coſt the procuring of ſome of thoſe ſubſtances from which the ſpirit is drawn; and diſtilling this with water, the eſſential oil will always give the flavour deſired. Thus, to imitate Jamaica rum, it will only be neceſſary to procure ſome of the tops, or other uſeleſs parts, of the ſugar-canes; from which an eſſential oil being drawn, and mixed with clean molaſſes ſpirit, will give it the true flavour. The principal difficulty muſt lie in procuring a ſpirit totally, or nearly, free of all flavour of its own. The ſpirit drawn from the refuſe of a ſugar-houſe is by our author commended as ſuperior to that drawn from molaſſes: though even this is not entirely devoid of ſome kind of flavour of its own; nor indeed is that drawn from the beſt refined ſugar entirely flavourleſs. It is very probable, therefore, that to procure an abſolutely flavourleſs ſpirit is impoſſible. The only method, therefore, of imitating foreign ſpirits is, by chooſing ſuch materials as will yield a ſpirit flavoured as much like them as poſſible.

12 Raiſins the beſt material for procuring pure ſpirit.

The materials moſt recommended by our author in this caſe, and probably the beſt that can be uſed, are raiſins. Concerning theſe he gives the following directions: "In order to extract this ſpirit, the raiſins muſt be infuſed in a proper quantity of water, and fermented in the manner already directed. When the fermentation is completed, the whole is to be thrown into the ſtill, and the ſpirit extracted by a ſtrong fire. The reaſon why we here direct a ſtrong fire is, becauſe by that means a greater quantity of the eſſential oil will come over the helm with the ſpirit, which will render it fitter for the diſtiller's purpoſe: for this ſpirit is commonly uſed to mix with common malt goods: and it is ſurpriſing how far it will go in this reſpect, ten gallons of it being often ſufficient to give a determining flavour and agreeable vinoſity to a whole piece of malt ſpirits. It is therefore well worth the diſtiller's while to endeavour at improving the common method of extracting ſpirits from raiſins; and perhaps the following hint may merit attention. When the fermentation is completed, and the ſtill charged with fermented liquor as above directed, let the whole be drawn off with as briſk a fire as poſſible; but, inſtead of the caſk or can generally uſed by diſtillers for a receiver, let a large glaſs, called by chemiſts a *ſeparating glaſs*, be placed under the noſe of the worm, and a common receiver applied to the ſpout of the ſeparating glaſs: by this means the eſſential oil will ſwim upon the top of the ſpirit, or rather low wine, in the ſeparating glaſs, and may be eaſily preſerved at the end of the operation. The uſe of this limpid eſſential oil is well known to diſtillers; for in this reſides the whole flavour, and conſequently may be uſed to the greateſt advantage in giving that diſtinguiſhing taſte and true vinoſity to the common malt ſpirits. After the oil is ſeparated from the low-wine, the liquor may be rectified in balneo mariæ into a pure and almoſt taſteleſs ſpirit, and therefore well adapted to make the fineſt compound cordials, or to imitate or mix with the fineſt French brandies, arracks, &c. In the ſame manner a ſpirit may be obtained from cyder. But as its particular flavour is not ſo deſirable as that obtained from raiſins, it ſhould be diſtilled in a more gentle manner, and carefully rectified according to the directions we have already given."

13 Directio fordiſtill compoun ſpirits.

Theſe directions may ſuffice for the diſtillation of any kind of ſimple ſpirits. The diſtillation of compound ones depends on the obſervation of the following general rules, which are very eaſy to be learned and practiſed.

1. The artiſt muſt always be careful to uſe a well cleanſed ſpirit, or one freed from its own eſſential oil. For, as a compound water is nothing more than a ſpirit impregnated with the eſſential oil of the ingredients, it is neceſſary that the ſpirit ſhould have depoſited its own.

2. Let the time of previous digeſtion be proportioned to the tenacity of the ingredients, or the ponderoſity of their oil.

3. Let the ſtrength of the fire alſo be proportioned to the ponderoſity of the oil intended to be raiſed with the ſpirit.

4. Let only a due proportion of the fineſt parts of the eſſential oil be united with the ſpirit; the groſſer and leſs fragrant parts of the oil not giving the ſpirit ſo agreeable a flavour, and at the ſame time rendering it unſightly. This may in a great meaſure be effected by leaving out the faints, and making up to proof with fine ſoft water in their ſtead.

A careful obſervation of theſe four rules will render this part of diſtillation much more perfect than it is at preſent. Nor will there be any occaſion for the uſe of burnt alum, white of eggs, iſinglaſs, &c. to fine down cordial waters; for they will preſently be fine, ſweet and pleaſant taſted, without any further trouble. We ſhall now ſubjoin particular receipts for making ſome of thoſe compound waters, or ſpirits, that are moſt commonly to be met with, and are in the moſt general eſtimation.

14 Receipts a number compoun ſpirits.

*Strong Cinnamon-water*. Take eight pounds of fine cinnamon bruiſed, 17 gallons of clean rectified ſpirit, and two gallons of water. Put them into your ſtill, and digeſt them 24 hours with a gentle heat; after which draw off 16 gallons with a pretty ſtrong heat.—A cheaper ſpirit, but of an inferior quality, may be obtained by uſing caſſia lignea inſtead of cinnamon. If you would dulcify your cinnamon water, take double-refined ſugar in what quantity you pleaſe; the general proportion is about two pounds to a gallon; and diſſolve it in the ſpirit, after you have made it up proof with clean water. One general caution is here neceſſary to be added; namely, that near the end of the operation, you carefully watch the ſpirit as it runs into the receiver, in order to prevent the faints from mixing with the goods. This you may diſcover by often catching ſome of it as it runs from the worm in a glaſs, and obſerving whether it is fine and tranſparent; for as ſoon as ever the faints begin to riſe, the ſpirit will have an azure or bluiſh caſt. As ſoon as this alteration in colour is perceived, the receiver muſt be immediately changed; for if the faints are ſuffered to mix themſelves with the reſt, the value of the goods will be greatly leſſened.—Here we may obſerve, that the diſtillers call ſuch goods as are made up proof, *double goods*; and thoſe below proof, *ſingle*.

*Clove-water.* Take of cloves bruiſed, four pounds; pimento, or all-ſpice, half a pound; proof-ſpirit, 16 gallons. Digeſt the mixture 12 hours in a gentle heat, and then draw off 15 gallons with a pretty briſk fire. The water may be coloured red, either by a ſtrong tincture of cochineal, alkanet, or corn-poppy flowers. It may be dulcified at pleaſure with double refined ſugar.

*Lemon-water.* Take of dried lemon-peel, four pounds; clean proof ſpirit 10 gallons and a half, and one gallon of water. Draw off 10 gallons by a gentle fire, and dulcify with fine ſugar.

*Citron-water.* Take of dry yellow rhinds of citrons, three pounds; of orange-peel, two pounds; nutmegs bruiſed, three quarters of a pound; clean proof-ſpirit, ten gallons and a half; water, one gallon: digeſt with a gentle heat; then draw off ten gallons in balneo mariæ, and dulcify with fine ſugar.

*Aniſeed-water.* Take of aniſeed bruiſed, two pounds; proof-ſpirit, 12 gallons and a half; water, one gallon: draw off ten gallons with a moderate fire.—This water ſhould never be reduced below proof; becauſe the large quantity of oil with which it is impregnated, will render the goods milky and foul when brought down below proof. But if there is a neceſſity for doing this, their tranſparency may be reſtored by filtration.

*Orange-water.* Take of the yellow part of freſh orange-peel, five pounds; clean proof-ſpirit, ten gallons and a half; water, two gallons: draw off ten gallons with a gentle fire.

*Cedrat-water.* The cedrat is a ſpecies of citron, and very highly eſteemed in Italy where it grows naturally. The fruit is difficult to be procured in this country; but as the eſſential oil is often imported from Italy, it may be made with it according to the following receipt.—Take of the fineſt loaf-ſugar reduced to powder, a quarter of a pound; put it into a glaſs mortar, with 120 drops of the eſſence of cedrat; rub them together with a glaſs peſtle; and put them into a glaſs alembic, with a gallon of fine proof-ſpirits and a quart of water. Place the alembic in balneo mariæ, and draw off one gallon, or till the faints begin to riſe; and dulcify with fine ſugar. This is reckoned the fineſt cordial yet known; it will therefore be neceſſary to be particularly careful that the ſpirit is perfectly clean, and, as much as poſſible, freed from any flavour of its own.

*Orange Cordial-water*, or *Eau de Bigarade.* Take the outer or yellow part of the peels of 14 bigarades, (a kind of oranges); half an ounce of nutmegs, a quarter of an ounce of mace, a gallon of fine proof-ſpirit, and two quarts of water. Digeſt all theſe together two days in a cloſe veſſel; after which draw off a gallon with a gentle fire, and dulcify with fine ſugar. This cordial is greatly eſteemed abroad, but is not ſo well known in this country.

*Ros Solis.* Take of the herb called *Ros Solis*, picked clean, four pounds; cinnamon, cloves, and nutmegs, of each three ounces and a half; marigold flowers, one pound; caraway-ſeeds, ten ounces; proof-ſpirit, ten gallons; water, three gallons. Diſtil with a pretty ſtrong fire, till the faints begin to riſe. Then take of liquorice-root ſliced, half a pound; raiſins ſtoned, two pounds; red ſaunders, half a pound: digeſt theſe three days in two quarts of water; then ſtrain out the clear liquor, in which diſſolve three pounds of fine ſugar, and mix it with the ſpirit drawn by diſtillation.

*Uſquebaugh.* Take nutmegs, cloves, and cinnamon, of each two ounces; the ſeeds of aniſe, caraway, and coriander, of each four ounces; of liquorice-root ſliced, half a pound. Bruiſe the ſeeds and ſpices; and put them, together with the liquorice, into the ſtill with 11 gallons of proof-ſpirits, and two gallons of water. Diſtil with a pretty briſk fire till the faints begin to riſe. But, as ſoon as the ſtill begins to work, faſten to the noſe of the worm two ounces of Engliſh ſaffron tied up in a cloth, that the liquor may run thro' it, and extract all its tincture; and in order to this, you ſhould frequently preſs the ſaffron with your fingers. When the operation is finiſhed, dulcify your goods with fine ſugar.

*Ratafia.* Is a liquor prepared from different kinds of fruits, and is of different colours according to the fruits made uſe of. Of red ratafia there are three kinds, the fine, the dry or ſharp, and the common. The fruits moſt proper for making red ratafia, are the black heart-cherry, the common red cherry, the black cherry, the mery or honey cherry, the ſtrawberry, the raſpberry, the red gooſeberry, and the mulberry. Theſe fruits ſhould be gathered when in their greateſt perfection, and the largeſt and moſt beautiful of them choſen for the purpoſe.—The following is a receipt for making red ratafia, fine and ſoft. Take of the black heart-cherries 24 pounds; black cherries, four pounds; raſpberries and ſtrawberries, of each three pounds. Pick the fruits from their ſtalks, and bruiſe them; in which ſtate let them continue 12 hours: preſs out the juice; and to every pint of it add a quarter of a pound of ſugar. When the ſugar is diſſolved, run the whole through the filtrating bag, and add to it three quarts of clean proof-ſpirits. Then take of cinnamon, four ounces; of mace, one ounce; and of cloves, two drams. Bruiſe theſe ſpices; put them into an alembic with a gallon of clean proof-ſpirits and two quarts of water, and draw off a gallon with a briſk fire. Add as much of this ſpicy ſpirit to your ratafia as will render it agreeable to your palate; about one fourth is the uſual proportion.

Ratafia made according to the above receipt will be of a very rich flavour and elegant colour. It may be rendered more or leſs of a ſpicy flavour, by adding or diminiſhing the quantity of ſpirit diſtilled from the ſpices.—Some, in making ratafia, ſuffer the expreſſed juices of their fruits to ferment ſeveral days: by this means the vinoſity of the ratafia is increaſed; but, at the ſame time, the elegant flavour of the fruits is greatly diminiſhed. Therefore, if the ratafia is deſired ſtronger or more vinous, it may be done by adding more ſpirits to the expreſſed juice; by which means the flavour of the fruits may be preſerved, as well as the ratafia rendered ſtronger. It is alſo a method with ſome to tie the ſpices in a linen bag, and ſuſpend them in the rataſia. But if this method is taken, it will be neceſſary to augment the quantity of ſpirit firſt added to the expreſſed juice. There is no great difference in the two methods of adding the ſpices, except that by ſuſpending them in the ratafia the liquor is rendered leſs tranſparent.

*Dry or ſharp Ratafia.* Take cherries and gooſeberries, of each 30 pounds; mulberries, ſeven pounds; raſpberries, ten pounds. Pick all theſe fruits clean from their ſtalks, &c. bruiſe them, and let them ſtand 12 hours; but do not ſuffer them to ferment. Preſs out the juice, and to every pint add three ounces of ſugar. When the ſugar is diſſolved, run it through the filtrating bag, and to every five pints of liquor add four pints of clean proof-ſpirit; together with the ſame proportion of ſpirit drawn from the ſpices in the foregoing compoſition.

*Common Ratafia.* Take of nutmegs, eight ounces; bitter almonds, ten pounds; Liſbon ſugar, eight pounds; ambergreaſe, ten grains: infuſe theſe ingredients three days in ten gallons of clean proof-ſpirit, and filter thro' a flannel bag for uſe. The nutmegs and bitter almonds muſt be bruiſed, and the ambergreaſe rubbed with the Liſbon ſugar in a marble mortar, before they are infuſed in the ſpirit.

*Gold Cordial.* Take of the roots of angelica, four pounds; raiſins ſtoned, two pounds; coriander ſeeds, half a pound; caraway-ſeeds and cinnamon, of each half a pound; cloves, two ounces; figs and liquorice-root, of each one pound; proof-ſpirit, eleven gallons; water, two gallons. The angelica, liquorice, and figs, muſt be ſliced before they are added. Digeſt two days; and draw off by a gentle heat till the faints begin to riſe; hanging in a piece of linen, faſtened to the mouth of the worm, an ounce of Engliſh ſaffron. Then diſſolve eight pounds of ſugar in three quarts of roſe-water, and add to it the diſtilled liquor.—This liquor derives its name of *Gold Cordial,* from a quantity of leaf-gold being formerly added to it; but this is now generally diſuſed, as it cannot poſſibly add any virtue.

*Cardamum,* or *All-fours.* Take of pimento, caraway, and coriander ſeeds, and lemon-peel, each three pounds; of malt ſpirits, eleven gallons; water, three gallons. Draw off with a gentle fire, dulcify with common ſugar, and make up to the ſtrength deſired with clear water.—This is a dram greatly uſed by the poorer ſort of people in ſome countries.

*Geneva.* There was formerly ſold in the apothecaries ſhops a diſtilled ſpirituous water of juniper; but the vulgar being fond of it as a dram, the diſtillers ſupplanted the apothecaries, and ſold it under the name of *Geneva.* The common kind, however, is not made from juniper-berries, but from oil of turpentine; and indeed it is ſurpriſing, that people ſhould accuſtom themſelves to drink ſuch liquors for pleaſure.—The receipt for making this kind of ſpirit, ſold in the gin-ſhops at London, is as follows. Take of the ordinary malt ſpirits, ten gallons; oil of turpentine, two ounces; bay-ſalt, three handfuls. Draw off by a gentle fire till the faints begin to riſe; and make up your goods to the ſtrength required with clear water.

The beſt kind is made by the following recipe.—Take of juniper-berries, three pounds; proof-ſpirit, ten gallons; water, four gallons: Draw off by a gentle fire till the faints begin to riſe, and make up your goods to the ſtrength required with clean water.

There is a ſort of this liquor called *Hollands Geneva,* from its being imported from Holland, which is greatly eſteemed.—The ingredients uſed by the Dutch are the ſame with thoſe given in the laſt recipe; only, inſtead of malt-ſpirits, they uſe French brandy. But from what has been already obſerved concerning the nature of theſe kind of ſpirits, it is eaſy to ſee, that by the help of a well rectified ſpirit, geneva may be made in this country at leaſt nearly equal to the Dutch, provided it is kept to a proper age; for all ſpirituous liquors contract a ſoftneſs and mellowneſs by age, impoſſible to be imitated any other way.

DISTILLERY, the art of diſtilling brandy and other ſpirits. This art was firſt brought into Europe by the Moors of Spain, about the year 1150: they learned it of the African Moors, who had it from the Egyptians: and the Egyptians are ſaid to have practiſed it in the reign of the emperor Diocleſian, though it was unknown to the ancient Greeks and Romans. See Distillation, and Fermentation.

DISTINCTION, in logic, is an aſſemblage of two or more words, whereby diſparate things, or their conceptions, are denoted.

DISTORTION, in medicine, is when any part of the human body remarkably deviates from its natural ſhape or poſition. Diſtortions of different parts may ariſe either from a convulſion or palſy; though ſometimes a terrible diſtortion in the ſhape of the whole body hath ariſen merely from careleſſneſs and ill habits. Mr Winſlow, in the Memoirs of the Academy of Sciences at Paris, gives a very remarkable account of a lady of quality, whom he had known to be perfectly ſtraight for ſeveral years; but who taking afterwards to a ſedentary courſe of life, got a cuſtom of dreſſing herſelf very careleſsly, and of leaning as ſhe ſat, either forwards or to a ſide. It was not many months before ſhe found it painful and troubleſome to ſtand or ſit upright; and ſoon afterwards ſhe found an inequality in the lower part of the back-bone. Alarmed at this, ſhe conſulted the gentleman who gave the account. To prevent the increaſe of the malady, he ordered her to wear a particular ſort of jumps inſtead of ſtays, and had a pad of a proper ſize applied: but this was ſoon neglected; and the conſequence was, that in a little time the back-bone became more and more crooked, and at length bent itſelf ſidewiſe in two contrary directions, ſo as to repreſent the figure of the Roman S; and the lady, ſtill refuſing to take the proper meaſures, loſt a fourth part of her height; and continued for the remainder of her life, not only crooked from right to left and from left to right, but ſo oddly folded together, that the firſt of the falſe ribs on one ſide approached very near the creſt of the os ilium on that ſide, and the viſcera of the lower belly became ſtrangely puſhed out of their regular places to the oppoſite ſide; and the ſtomach itſelf was ſo ſtrongly compreſſed, that whatever ſhe ſwallowed ſeemed to her to fall into two ſeparate cavities.

DISTRESS, in its ordinary acceptation, denotes calamity, miſery, or painful ſuffering.

*The Contemplation of* Distress, *a ſource of pleaſure.* On this ſubject we have a very pleaſing and ingenious eſſay by Dr Barnes, in the Memoirs of the Literary

and

and Philoſophical Society of Mancheſter *. It is introduced with the following motto:

l. I.
4, &c.

*Suave mari magno, turbantibus æquora ventis,*
*E terrâ alterius magnum ſpectare periclum.*
*Non quia vexari quenquam eſt jucunda voluptas;*
*Sed quibus ipſe malis careas, quia cernere ſuave eſt.*
LUCRETIUS.

"The pleaſure here deſcribed by the poet, and of which he has mentioned ſo ſtriking and appoſite an inſtance, may perhaps at firſt ſeem of ſo ſingular and aſtoniſhing a nature, that ſome may be diſpoſed to doubt of its exiſtence. But that it does exiſt, in the caſe here referred to, and in many others of a ſimilar kind, is an undoubted fact; and it may not appear an uſeleſs or diſagreeable entertainment, to trace its ſource in the human breaſt, together with the final cauſe for which it was implanted there by our benevolent Creator.

"Shall I, it may be ſaid, feel complacency in beholding a ſcene in which many of my fellow-creatures are agonizing with terror, whilſt I can neither diminiſh their danger, nor, by my ſympathy, divide their anguiſh? At the ſight of another's wo, does not my boſom naturally feel pain? Do I not ſhare in his ſenſations? And is not this ſtrong and exquiſite ſenſibility intended by my Maker to urge me on to active and immediate aſſiſtance? Theſe ſenſations are indeed attended with a noble pleaſure, when I can, by friendly attention, or by benevolent communication, ſoothe the ſorrows of the poor mourner, ſnatch him from impending danger, or ſupply his preſſing wants. But in general, where my ſympathy is of no avail to the wretched ſufferer, I fly from the ſpectacle of his miſery, unable or unwilling to endure a pain which is not allayed by the ſweet ſatisfaction of doing good."

It will be neceſſary, in anſwer to theſe objections, in the firſt place to prove the reality of the feeling, the cauſe of which, in the human conſtitution, we here attempt to explore.

Mr Addiſon, in his beautiful papers on the Pleaſures of the Imagination, has obſerved, "that objects or ſcenes, which, when real, give diſguſt or pain, in deſcription often become beautiful and agreeable. Thus, even a dunghill may, by the charms of poetic imagery, excite pleaſure and entertainment. Scenes of this nature, dignified by apt and ſtriking deſcription, we regard with ſomething of the ſame feelings with which we look upon a dead monſter.

——————*Informe cadaver*
*Protrahitur: nequeunt expleri corda tuendo*
*Terribiles oculos, vultum, villoſaque ſetis*
*Pectora ſemiferi, atque extinctos faucibus ignes.* VIRGIL.

"This (he obſerves) is more particularly the caſe, where the deſcription raiſes a ferment in the mind and works with violence upon the paſſions. One would wonder (adds he) how it comes to paſs, that paſſions, which are very unpleaſant at all other times, are very agreeable when excited by proper deſcription; ſuch as terror, dejection, grief, &c. This pleaſure ariſes from the reflection we make upon ourſelves, whilſt reading it, that we are not in danger from them. When we read of wounds, death, &c. our pleaſure does not riſe ſo properly from the grief which theſe melancholy deſcriptions give us, as from the ſecret compariſon we make of ourſelves with thoſe who ſuffer. We ſhould not feel the ſame kind of pleaſure, if we actually ſaw a perſon lying under the tortures that we meet with in a deſcription."

And yet, upon the principle aſſigned by this amiable writer, we might feel the ſame, or even higher pleaſure, from the actual view of diſtreſs, than from any deſcription; becauſe the compariſon of ourſelves with the ſufferer would be more vivid, and conſequently the feeling more intenſe. We would only obſerve, that the cauſe which he aſſigns for this pleaſure is the very ſame with that aſſigned by Lucretius in our motto. Mr Addiſon applies it to the deſcription; the poet, to the actual contemplation of affecting ſcenes. In both the pleaſure is ſuppoſed to originate in ſelfiſhneſs. But wherever the ſocial paſſions are deeply intereſted, as they are here ſuppoſed to be, from the pathetic deſcription, or the ſtill more pathetic ſurvey, of the ſufferings of another, the ſympathetic feelings will of themſelves, at once, and previouſly to all reflection, become a ſource of agreeable and tender emotions. They will thus dignify and enhance the ſatisfaction, if any ſuch be felt, ariſing merely from the conſideration of our own perſonal ſecurity. And the more entirely we enter into the ſcene, by loſing all ideas of its being either paſt or fabulous, the more perfectly we forget ourſelves, and are abſorbed in the feeling,—the more exquiſite is the ſenſation.

But as our ſubſequent ſpeculations will chiefly turn upon the pleaſure derived from real ſcenes of calamity, and not from thoſe which are imaginary, it may be expected that we produce inſtances in proof that ſuch pleaſure is felt by perſons very different in their taſte and mental cultivation.

We ſhall not mention the horrid joy with which the ſavage feaſts his eye upon the agonies and contortions of his expiring priſoner—expiring in all the pains which artificial cruelty can inflict! Nor will we recur to the almoſt equally ſavage ſons of ancient Rome, when the majeſty of the Roman people could ruſh, with eagerneſs and tranſport, to behold hundreds of gladiators contending in fatal conflict, and probably more than half the number extended, weltering in blood and writhing in agony, upon the plain. Nor will we mention the Spaniſh bull-feaſts; nor the fervent acclamations of an Engliſh mob around their fellow-creatures, when engaged in furious battle, in which it is poſſible that ſome of the combatants may receive a mortal blow, and be hurried in this awful ſtate to the bar of his Judge. Let us ſurvey the multitudes which, in every part of the kingdom, always attend an execution. It may perhaps be ſaid, that in all places the vulgar have little of the ſenſibility and tenderneſs of more poliſhed boſoms. But, in the laſt mentioned inſtance, an execution, there is no exultation in the ſufferings of the poor criminal. He is regarded by every eye with the moſt melting compaſſion. The whole aſſembly ſympathizes with him in his unhappy ſituation. An awful ſtillneſs prevails at the dreadful moment. Many are wrung with unutterable ſenſations; and prayer and ſilence declare, more loudly than any language could, the intereſt they feel in his diſtreſs. Should a reprieve come to reſcue him from death, how great is the general triumph and congratulation! And probably in this multitude you will find not the mere vulgar herd alone, but the man of ſuperior knowledge and of more refined ſenſibility; who, led by ſome ſtrong principle, which we wiſh to explain, feels a pleaſure greater than all the pain, great and exquiſite as one ſhould imagine it to be, from ſuch a ſpectacle.

The man who condemns many of the ſcenes we have already mentioned as barbarous and ſhocking, would probably run with the greateſt eagerneſs to ſome high cliff, overhanging the ocean, to ſee it ſwelled into a tempeſt, though a poor veſſel, or even a fleet of veſſels, were to appear as one part of the dreadful ſcenery, now lifted to the heavens on the foaming ſurge, now plunged deep into the fathomleſs abyſs, and now daſhed upon the rocks, where they are in a moment ſhivered into fragments, and, with all their mariners, entombed in the wave. Or, to vary the queſtion a little; Who would not be forward to ſtand ſafe, on the top of ſome mountain or tower, adjoining to a field of battle, in which two armies meet in deſperate conflict, though probably thouſands may ſoon lie before him proſtrate on the ground, and the whole field preſent the moſt horrid ſcenes of carnage and deſolation?

That in all theſe caſes pleaſure predominates in the compounded feeling, is plain from hence, becauſe you continue to ſurvey the ſcene; whereas when pain became the ſtronger ſenſation, you would certainly retire.

Cultivation may indeed have produced ſome minuter differences in the taſte and feelings of different minds. Thoſe whoſe ſenſibilities have not been refined by education or ſcience, may feel the pleaſure in a more groſs and brutal form. But do not the moſt poliſhed natures feel a ſimilar, a kindred pleaſure, in the deep-wrought diſtreſſes of the well-imagined ſcene? Here the endeavour is, to introduce whatever is dreadful or pathetic, whatever can harrow up the feelings or extort the tear. And the deeper and more tragical the ſcene becomes, the more it agitates the ſeveral paſſions of terror, grief, or pity—the more intenſely it delights, even the moſt poliſhed minds. They ſeem to enjoy the various and vivid emotions of contending paſſions. They love to have the tear trembling in the eye, and to feel the whole ſoul wrapt in thrilling ſenſations. For that moment they ſeem to forget the fiction; and afterwards commend that exhibition moſt, in which they moſt entirely loſt ſight of the author, and of their own ſituation, and were alive to all the unutterable vibrations of ſtrong or melting ſenſibility.

Taking it then for granted, that in the contemplation of many ſcenes of diſtreſs, both imaginary and real, a gratification is felt, let us endeavour to account for it, by mentioning ſome of thoſe principles, woven into the web of human nature, by its benevolent Creator, on which that gratification depends.

Dr Akenſide, with his accuſtomed ſtrength and brilliancy of colouring, deſcribes and accounts for it in the following manner.

———————"Behold the ways  
Of heaven's eternal deſtiny to man!  
For ever juſt, benevolent, and wiſe!  
That Virtue's awful ſteps, howe'er purſued  
By vexing fortune, and intruſive pain.  
Should never be divided from her chaſte,  
Her fair attendant, Pleaſure. Need I urge  
Thy tardy thought, through all the various round  
Of this exiſtence, that thy ſoftening ſoul  
At length may learn, what energy the hand  
Of Virtue mingles in the bitter tide  
Of Paſſion, ſwelling with diſtreſs and pain,  
To mitigate the ſharp, with gracious drops  
Of cordial Pleaſure. Aſk the faithful youth,  
Why the cold urn of her, whom long he loved,  
So often fills his arm? So often draws  
His lonely footſteps, at the ſilent hour,  
To pay the mournful tribute of his tears?  
O! he will tell thee, that the wealth of worlds  
Should ne'er ſeduce his boſom to forego  
That ſacred hour, when ſtealing from the noiſe  
Of care and envy, ſweet remembrance ſooths,  
With Virtue's kindeſt looks, his aching breaſt,  
And turns his tears to rapture. Aſk the croud,  
Which flies impatient from the village-walk  
To climb the neighbouring cliffs, when far below  
The cruel winds have hurled upon the coaſt  
Some helpleſs bark: whilſt ſacred Pity melts  
The general eye, or Terror's icy hand  
Smites their diſtorted limbs, or horrent hair,  
While every mother cloſer to her breaſt  
Catches her child; and, pointing where the waves  
Foam through the ſhattered veſſel, ſhrieks aloud,  
As one poor wretch, that ſpreads his piteous arms  
For ſuccour, ſwallowed by the roaring ſurge,  
As now another, daſhed againſt the rock,  
Drops lifeleſs down. O deemeſt thou indeed  
No kind endearment here, by nature given,  
To mutual terror, and compaſſion's tears?  
No ſweetly melting ſoftneſs, which attracts  
O'er all that edge of pain, the ſocial powers,  
To this their proper action, and their end?"

The poet purſues the ſentiment in the ſame animated imagery, deſcribing the ſtrong, but pleaſurable, ſenſations which the ſoul feels, in reading the ſufferings of heroes who nobly died in the cauſe of liberty and their country:

———————"When the pious band  
Of youths, who fought for freedom, and their ſires,  
Lie ſide by ſide in gore."

Or, in the ſtrong movements of indignation and revenge againſt the tyrant, who invades that liberty, and enſlaves their country.

——— ———"When the patriot's tear  
Starts from thine eye, and thy extended arm  
In fancy hurls the thunderbolt of Jove,  
To fire the impious wreath on Philip's brow,  
Or daſh Octavius from his trophied car;  
Say—Does thy ſecret ſoul repine to taſte  
The big diſtreſs? Or, would'ſt thou then exchange  
Theſe heart-ennobling ſorrows for the lot  
Of him, who ſits amid the gaudy herd  
Of mute barbarians, bending to his nod,  
And hears aloft his gold-inveſted front,  
And ſays within himſelf, "I am a king,  
And wherefore ſhould the clamorous voice of wo  
Intrude upon mine ear?"

The ſentiment of this charming and moral poet is, that ſympathetic feelings are virtuous, and therefore pleaſant. And from the whole, he deduces this important concluſion; that every virtuous emotion muſt be agreeable, and that this is the ſanction and the reward of virtue. The thought is amiable; the concluſion noble: but ſtill the ſolution appears to us to be imperfect.

We have already ſaid, that the pleaſure ariſing from the contemplation of diſtreſsful ſcenes is a compounded feeling, ariſing from ſeveral diſtinct ſources in the human breaſt. The kind and degree of the ſenſation muſt depend upon the various blendings of the ſeveral ingredients which enter into the compoſition. The cauſe aſſigned by Mr Addiſon, the ſenſe of our own ſecurity, may be ſuppoſed to have ſome ſhare in the maſs of feelings. That of Dr Akenſide may be allowed to have

have a ſtill larger proportion. Let us attempt to trace ſome of the reſt.

There are few principles in human nature of more general and important influence than that of ſympathy. A late ingenious writer, led by the faſhionable idea of ſimplifying all the ſprings of human nature into one ſource, has, in his beautiful Theory of Moral Sentiments, endeavoured to analyſe a very large number of the feelings of the heart into ſympathetic vibration. Though it appears to us moſt probable, that the human mind, like the human body, poſſeſſes various and diſtinct ſprings of action and of happineſs, yet he has ſhown, in an amazing diverſity of inſtances, the operation and importance of this principle of human nature. Let us apply it to our preſent ſubject.

We naturally ſympathize with the paſſions of others. But if the paſſions they appear to feel be not thoſe of mere diſtreſs alone; if, midſt the ſcenes of calamity, they diſplay fortitude, generoſity, and forgiveneſs; if, "riſing ſuperior to the cloud of ills which covers them," they nobly ſtand firm, collected, and patient; here a ſtill higher ſource of pleaſure opens upon us, from complacence, admiration, and that unutterable ſympathy which the heart feels with virtuous and heroic minds. By the operation of this principle, we place ourſelves in their ſituation; we feel, as it were, ſome ſhare of that conſcious integrity and peace which they muſt enjoy. Hence, as before obſerved, the pleaſure will vary, both as to its nature and degree, according to the ſcene and characters before us. The ſhock of contending armies in the field,—the ocean wrought to tempeſt, and covered with the wreck of ſhattered veſſels,—and a worthy family ſilently, yet nobly, bearing up againſt a multitude of ſurrounding ſorrows, will excite very different emotions, becauſe the component parts of the pleaſurable ſenſation conſiſt of very different materials. They all excite admiration; but admiration, how diverſified, both as to its degree and its cauſe! Theſe ſeveral ingredients may doubtleſs be ſo blended together, that the pleaſure ſhall make but a very ſmall part of the mixed ſenſation. The more agreeable tints may bear little proportion to the terrifying red or the gloomy black.

In many of the inſtances which have been mentioned, the pleaſure muſt ariſe chiefly, if not ſolely, from the circumſtances or accompanyments of the ſcene. The ſublime feelings excited by the view of an agitated ocean, relieve and ſoften thoſe occaſioned by the ſhipwreck. And the awe excited by the preſence of thouſands of men, acting as with one ſoul, and diſplaying magnanimity and firmneſs in the moſt ſolemn trial, tempers thoſe ſenſations of horror and of pain which would ariſe from the field of battle.

The gratification we are attempting to account for, depends alſo, in a very conſiderable degree, upon a principle of human nature, implanted in it for the wiſeſt ends; the exerciſe which it gives to the mind, by rouſing it to energy and feeling. Nothing is ſo inſupportable, as that langour and ennui, for the full expreſſion of which our language does not afford a term. How agreeable it is, to have the ſoul called forth to exertion and ſenſibility, let the gameſter witneſs, who, unable to endure the laſſitude and ſameneſs of unanimated luxury, runs with eagerneſs to the place where probably await him all the irritation and agony of tumultuous paſſions.

Again; it is a law of our nature, that oppoſite paſſions, when felt in ſucceſſion, and, above all, when felt at the ſame moment, heighten and increaſe each other. Eaſe ſucceeding pain, certainty after ſuſpenſe, friendſhip after averſion, are unſpeakably ſtronger than if they had not been thus contraſted. In this conflict of feelings, the mind riſes from paſſive to active energy. It is rouſed to intenſe ſenſation; and it enjoys that peculiar, exquiſite, and complex feeling, in which, as in many articles of our table, the acid and the ſweet, the pleaſurable and painful, pungencies are ſo happily mixed together, as to render the united ſenſation amazingly more ſtrong and delightful.

We have not yet mentioned the principle of curioſity, that buſy and active power, which appears ſo early, continues almoſt unimpaired ſo long, and to which, for the wiſeſt ends, is annexed ſo great a ſenſe of enjoyment. To this principle, rather than to a love of cruelty, would we aſcribe that pleaſure which children ſometimes ſeem to feel from torturing flies and leſſer animals. They have not yet formed an idea of the pain they inflict. It is, indeed, of unſpeakable conſequence, that this practice be checked as ſoon and as effectually as poſſible, becauſe it is ſo important, that they learn to connect the ideas of pleaſure and pain with the motions and actions of the animal creation. And to this principle may we alſo refer no ſmall ſhare of that pleaſure in the contemplation of diſtreſsful ſcenes, the ſprings of which, in the human heart, we are now endeavouring to open.

To curioſity, then—to ſympathy—to mental exertion—to the idea of our own ſecurity—and to the ſtrong feelings occaſioned by viewing the actions and paſſions of mankind in intereſting ſituations, do we aſcribe that gratification which the mind feels from the ſurvey of many ſcenes of ſorrow. We have called it a *pleaſure*; but it will approach towards, or recede from, pleaſure, according to the nature and proportion of the ingredients of which the ſenſation is compoſed. In ſome caſes, pain will predominate. In others, there will be exquiſite enjoyment.

The final cauſe of this conſtitution of the human mind is probably, that by means of this ſtrong ſenſation, the ſoul may be preſerved in continual and vigorous motion—that its feelings may be kept lively and tender—that it may learn to practiſe the virtues it admires—and to aſſiſt thoſe to whom its ſympathy can reach—and that it may thus be led, by theſe ſocial exerciſes of the heart, to ſoften with compaſſion—to expand with benevolence—and generouſly to aſſiſt in every caſe, in which aſſiſtance can be given. An end this ſufficient,

——— "To aſſert eternal Providence,
And juſtify the ways of God to man."

**Distress**, in law, the ſeizing or diſtraining any thing for rent in arrear, or other duty unperformed.

The effect of this diſtreſs is to compel the party either to replevy the things diſtrained, and conteſt the taking, in an action of treſpaſs againſt the diſtrainer; or rather to oblige him to compound and pay the debt or duty for which he was ſo diſtrained.

There are likewiſe compulſory diſtreſſes in actions, to cauſe a perſon appear in court; of which kind there is a diſtreſs perſonal of one's moveable goods, and the profits of his lands, for contempt in not appearing after ſummons: there is likewiſe diſtreſs real, of a perſon's immoveable goods. In theſe caſes none ſhall be diſtrained to anſwer for any thing touching their freeholds, but by the king's writ.

Diſtreſs may be either finite or infinite. Finite diſtreſs is that which is limited by law, in regard to the number of times it ſhall be made, in order to bring the party to a trial of the action. Infinite diſtreſs is that which is without any limitation, being made till the perſon appears: it is farther applied to jurors that do not appear; as, upon a certificate of aſſiſe, the proceſs is *venire facias*, *habeas corpora*, and diſtreſs infinite.

It is alſo divided into grand diſtreſs and ordinary diſtreſs; of theſe the former extends to all the goods and chattels that the party has within the county. A perſon, of common right, may diſtrain for rents and all manner of ſervices; and where a rent is reſerved on a gift in tail, leaſe for life, or years, &c. though there be no clauſe of diſtreſs in the grant or leaſe, ſo as that he has the reverſion: but on a feoffment made in fee, a diſtreſs may not be taken, unleſs it be expreſsly reſerved in the deed.

DISTRIBUTION, in a general ſenſe, the act of dividing a thing into ſeveral parts, in order to the diſpoſing each in its proper place.

Distribution, in architecture, the dividing and diſpoſing the ſeveral parts and pieces which compoſe a building, as the plan directs. See Architecture.

Distribution, in rhetoric, a kind of deſcription, whereby an orderly diviſion and enumeration is made of the principal qualities of the ſubject. David ſupplies us with an example of this kind, when, in the heat of his indignation againſt ſinners, he gives a deſcription of their iniquity: "Their throat is an open ſepulchre; they flatter with their tongues; the poiſon of aſps is under their lips; and their mouth is full of curſing and lies; and their feet are ſwift to ſhed blood."

Distribution, in printing, the taking a form aſunder, ſeparating the letters, and diſpoſing them in the caſes again, each in its proper cell. See Printing.

DISTRICT, in geography, a part of a province, diſtinguiſhed by peculiar magiſtrates, or certain privileges; in which ſenſe it is ſynonymous with hundred. See Hundred.

DISTRINGAS, in law, a writ commanding the ſheriff, or other officer, that he diſtrain a perſon for debt to the king, &c. or for his appearance at a certain day.

*Distringas Juratores*, a writ directed to the ſheriff, whereby he is commanded to diſtrain upon a jury to appear, and to return iſſues on their lands, &c. for nonappearance. This writ of diſtringas juratores iſſues for the ſheriff to have their bodies in court, &c. at the return of the writ.

DITCH, a common fence or incloſure in marſhes, or other wet land where there are no hedges. They allow theſe ditches ſix feet wide againſt highways that are broad; and againſt commons, five feet. But the common ditches about incloſures, dug at the bottom of the bank on which the quick is raiſed, are three feet wide at the top, one at the bottom, and two feet deep. By this means each ſide has a ſlope, which is of great advantage; for where this is neglected, and the ditches dug perpendicular, the ſides are always waſhing down, beſides, in a narrow bottomed ditch, if cattle get down into it, they cannot ſtand to turn themſelves to crop the quick: but where the ditch is four feet wide, it ſhould be two and a half deep; and where it is five wide, it ſhould be three deep; and ſo in proportion.

*Ditch-Water* is often uſed as an object for the microſcope, and ſeldom fails to afford a great variety of animalcules. This water very often appears of a yellowiſh, greeniſh, or reddiſh colour; and this is wholly owing to the multitudes of animals of thoſe colours which inhabit it. Theſe animals are uſually of the ſhrimp kind: and Swammerdam, who very accurately examined them, has called them, from the figure of their horns, *pulex aquaticus arboreſcens*. They copulate in May or June; and are often ſo numerous at that ſeaſon, that the whole body of the water they are found in, is ſeen to be of a red, green, or yellowiſh colour, according to the colours of their bodies. The green thin ſcum alſo, ſo frequently ſeen on the ſurface of ſtanding waters in ſummer, is no other than a multitude of ſmall animalcules of this or ſome of the other kinds. Dunghill water is not leſs full of animals than that of ditches; and is often found ſo thronged with animalcules, that it ſeems altogether alive: it is then ſo very much crowded with theſe creatures, that it muſt be diluted with clear water before they can be diſtinctly viewed. There are uſually in this fluid a ſort of eels, which are extremely active; and beſides theſe and many other of the common inhabitants of fluids, there is one ſpecies found in this which ſeems peculiar to it: the middle part of them is dark and beſet with hairs, but the ends are tranſparent; their tails are tapering, with a long ſprig at the extremity, and their motion is ſlow and waddling. See Animalcule.

Ditch, in fortification, called alſo *foſs* and *moat*, a trench dug round the rampart or wall of a fortified place, between the ſcarp and counterſcarp. See Fortification.

DITHYRAMBUS, in ancient poetry, a hymn in honour of Bacchus, full of tranſport and poetical rage.

This poetry owes its birth to Greece, and to the tranſports of wine; and yet art is not quite exploded, but delicately applied to guide and reſtrain the dithyrambic impetuoſity, which is indulged only in pleaſing flights. Horace and Ariſtotle tell us, that the ancients gave the name of dithyrambus to thoſe verſes wherein none of the common rules or meaſures were obſerved. As we have now no remains of the dithyrambus of the ancients, we cannot ſay exactly what their meaſure was.

DITONE, in muſic, an interval comprehending two tones. The proportion of the ſounds that form the ditone is 4 : 5, and that of the ſemiditone is 5 : 6.

DITRIHEDRIA, in mineralogy, a genus of ſpars with twice three ſides, or ſix planes; being formed of two trigonal pyramids joined baſe to baſe, without any intermediate column. See Spar.

The ſpecies of ditrihedria are diſtinguiſhed by the different figures of theſe pyramids.

DITTANDER, in botany. See Lepidium.

DITTANY, in botany. See Dictamnus.

DITTO, in books of accounts, uſually written D°, ſignifies the aforementioned. The word is corrupted from

from the Italian *detto*, "the ſaid:" as in our law-phraſe, "the ſaid premiſſes," meaning the ſame as were aforementioned.

DIVAL, in heraldry, the herb nightſhade, uſed by ſuch as blazon by flowers and herbs, inſtead of colours and metals, for ſable or black.

DIVALIA, in antiquity, a feaſt held among the ancient Romans, on the 21ſt day of December, in honour of the goddeſs Angerona; whence it is alſo called *Angeronalia*.—On the day of this feaſt, the pontifices performed ſacrifice in the temple of Voluptia, or the goddeſs of joy and pleaſure; who, ſome ſay, was the ſame with Angerona, and ſuppoſed to drive away all the ſorrows and chagrins of life.

DIVAN, a council-chamber or court of juſtice among the eaſtern nations, particularly the Turks.—The word is Arabic, and ſignifies the ſame with SOFA in the Turkiſh dialect.

There are two ſorts of divans; that of the grand ſignior, called *the council of ſtate*, which conſiſts of ſeven of the principal officers of the empire; and that of the grand vizir, compoſed of ſix other vizirs or counſellors of ſtate, the chancellor, and ſecretaries of ſtate, for the diſtribution of juſtice.

The word is alſo uſed for a hall in the private houſes of the orientals. The cuſtom of China does not allow the receiving of viſits in the inner parts of the houſe, but only at the entry, in a divan contrived on purpoſe for ceremonies.

Travellers relate wonders of the ſilence and expedition of the divans of the Eaſt.

*Divan-Beghi*, the ſuperintendant of juſtice in Perſia, whoſe place is the laſt of the ſix miniſters of the ſecond rank, who are all under the athemadauler or firſt miniſter. To this tribunal of the divan-beghi he appeals from ſentences paſſed by the governors. He has a fixed ſtipend of 50,000 crowns for adminiſtering juſtice. All the ſerjeants, uſhers, &c. of the court are in his ſervice. He takes cognifance of the criminal cauſes of the chams, governors, and other great lords of Perſia, when accuſed of any fault. There are divan-beghis not only at court and in the capital, but alſo in the provinces and other cities of the empire. The alcoran is the ſole rule of his adminiſtration of juſtice, which alſo he interprets at pleaſure. He takes no cogniſance of civil cauſes; but all differences ariſing between the officers of the king's houſehold and between foreign miniſters are determined by him.

DIVANDUROW, the name of ſeven iſlands which lie a league north of the Maldives, and 24 from the coaſt of Malabar, almoſt oppoſite to Cananor.

DIVER, in ornithology. See COLYMBUS.

DIVERGENT, or DIVERGING, LINES, in geometry, are thoſe which conſtantly recede from each other.

*DIVERGENT Rays*, in optics, are thoſe which, going from a point of the viſible object, are diſperſed, and continually depart one from another, in proportion as they are removed from the object: in which ſenſe it is oppoſed to convergent. See OPTICS.

DIVERSIFYING, in rhetoric, is of infinite ſervice to the orator; it is an accompliſhment eſſential to his character, and may fitly be called the ſubject of all his tropes and figures. Voſſius lays down ſix ways of diverſifying a ſubject. 1. By enlarging on what was briefly mentioned before. 2. By a conciſe enumeration of what had been inſiſted on at length. 3. By adding ſomething new to what is repeated. 4. By repeating only the principal heads of what had been ſaid. 5. By tranſpoſing the words and periods. 6. By imitating them.

DIVERSION, in military affairs, is when an enemy is attacked in one place where they are weak and unprovided, in order to draw off their forces from another place where they have made or intend to make an irruption. Thus the Romans had no other way in their power of driving Hannibal out of Italy, but by making a diverſion in attacking Carthage.

DIVESTING, properly ſignifies undreſſing, or ſtripping off one's garment; in contradiſtinction from inveſting.

In law, it is uſed for the act of ſurrendering or relinquiſhing one's effects. By a contract of donation or ſale, the donor or ſeller is ſaid to be diſſeiſed and diveſted of their property in ſuch a commodity, and the donee or purchaſer becomes inveſted therewith. See INVESTITURE.

A demiſe is a general diveſtiture which the fathers and mothers make of all their effects in favour of their children.

DIVIDEND, in arithmetic, the number propoſed to be divided into equal parts. See ARITHMETIC, n° 14.

*DIVIDEND of Stocks*, is a ſhare or proportion of the intereſt of ſtocks erected on public funds, as the ſouth-ſea, &c. divided among and paid to the adventurers half-yearly.

DIVINATION, the knowledge of things obſcure or future, which cannot be attained by any natural means.

It was a received opinion among the heathens, that the gods were wont to converſe familiarly with ſome men, whom they endowed with extraordinary powers, and admitted to the knowledge of their councils and deſigns. Plato, Ariſtotle, Plutarch, Cicero, and others, divide divination into two ſorts or ſpecies, *viz.* natural and artificial.

The former was ſo called, becauſe not attained by any rules or precepts of art, but infuſed or inſpired into the diviner, without his taking any further care about it than to purify and prepare himſelf for the reception of the divine afflatus. Of this kind were all thoſe who delivered oracles, and foretold future events by inſpiration, without obſerving external ſigns or accidents.

The ſecond ſpecies of divination was called *artificial*, becauſe it was not obtained by immediate inſpiration, but proceeded upon certain experiments and obſervations arbitrarily inſtituted, and moſtly ſuperſtitious. Of this ſort there were various kinds, as by ſacrifices, entrails, flame, cakes, flour, wine, water, birds, lots, verſes, omens, &c.

In holy ſcripture we find mention made of nine different kinds of divination. The firſt performed by the inſpection of planets, ſtars, and clouds: it is ſuppoſed to be the practiſers of this whom Moſes calls מעונן *meonen*, of אנן *anan*, "cloud," Deuter. ch. xviii. v. 10. 2. Thoſe whom the prophet calls in the ſame place מנחש *menacheſch*, which the vulgate and generality of interpreters render *augur*. 3. Thoſe who in the ſame place are called מכשף *mecaſcheph*, which the ſeptuagint and

and vulgate tranſlate "a man given to ill practices." 4. Such authors whom Moſes in the ſame chapter, ver. 11. calls חובר *bhober*. 5. Thoſe who conſult the ſpirits called *Python*; or, as Moſes expreſſes it in the ſame book, שאל אוב "thoſe who aſk queſtions of Python." 6. Witches or magicians, whom Moſes calls ידעני *judeoni*. 7. Thoſe who conſult the dead, *necromancers*. 8. The prophet Hoſea, chap. iv. ver. 12. mentions ſuch as conſult ſtaves, שאל מקלי; which kind of divination may be called *rhabdomancy*. 9. The laſt kind of divination mentioned in ſcripture is *hepatoſcopy*, or the conſideration of the liver.

Divination of all kinds was neceſſarily made an occult ſcience, which naturally remained in the hands of the prieſts and prieſteſſes, the magi, the ſoothſayers, the augurs, the viſionaries, the prieſts of the oracles, the falſe prophets, and other like profeſſors, till the time of the coming of Jeſus Chriſt. The light of the goſpel, it is true, has diſſipated much of this darkneſs; but it is more difficult, than is commonly conceived, to eradicate from the human mind a deep-rooted ſuperſtition, even though the truth be ſet in the ſtrongeſt light, eſpecially when the error has been believed almoſt from the origin of the world: ſo we ſtill find exiſting among us the remains of this pagan ſuperſtition, in the following chimeras, which enthuſiaſtic and deſigning men have formed into arts and ſciences; though it muſt be owned, to the honour of the 18th century, that the pure doctrines of Chriſtianity, and the ſpirit of philoſophy, which become every day more diffuſed, equally concur in baniſhing theſe viſionary opinions. The vogue for theſe pretended ſciences and arts, moreover, is paſt, and they can no longer be named without exciting ridicule in all ſenſible people. By relating them here, therefore, and drawing them from their obſcurity, we only mean to ſhow their futility, and to mark thoſe rocks againſt which the human mind, without the aſſiſtance of a pilot, might eaſily run.

For the attaining of theſe ſupernatural qualifications, there are ſtill exiſting in the world the remains of,

1. *Aſtrology*: a conjectural ſcience which teaches to judge of the effects and influences of the ſtars; and to predict future events by the ſituation of the planets and their different aſpects. It is divided into *natural aſtrology*, or *meteorology*; which is confined to the foretelling of natural effects, as the winds, rain, hail, and ſnow, froſts and tempeſts. In this conſiſts one branch of the art of almanack-makers; and by merely confronting theſe predictions in the kalendar, with the weather each day produces, every man of ſenſe will ſee what regard is to be paid to this part of aſtrology. The other part, which is called *judicial aſtrology*, is ſtill far more illuſive and raſh than the former: and having been at firſt the wonderful art of viſionaries, it afterwards became that of impoſtors; a very common fate with all thoſe chimerical ſciences, of which we ſhall here ſpeak. This art pretends to teach the method of predicting all ſorts of events that ſhall happen upon the earth, as well ſuch as relate to the public as to private perſons; and that by the ſame inſpection of the ſtars and planets and their different conſtellations. The *cabala* ſignifies, in like manner, the knowledge of things that are above the moon, as the celeſtial bodies and their influences; and in this ſenſe it is the ſame with judicial aſtrology, or makes a part of it.

2. *Horoſcopy*, which may alſo be conſidered as a part of aſtrology, is the art by which they draw a figure, or celeſtial ſcheme, containing the 12 houſes, wherein they mark the diſpoſition of the heavens at a certain moment; for example, that at which a man is born, in order to foretel his fortune, or the incidents of his life. In a word, it is the diſpoſition of the ſtars and planets at the moment of any perſon's birth. But as there cannot be any probable or poſſible relation between the conſtellations and the human race, all the principles they lay down, and the prophecies they draw from them, are chimerical, falſe, abſurd, and a criminal impoſition on mankind.

3. The art of *augury* conſiſted, among the ancient Romans, in obſerving the flight, the ſinging and eating of birds, eſpecially ſuch as were held ſacred. See AUGURY.

4. The equally deceitful art of *haruſpicy* conſiſted, on the contrary, in the inſpection of the bowels of animals, but principally of victims; and from thence predicting grand incidents relative to the republic, and the good or bad events of its enterpriſes.

5. *Aeromancy* was the art of divining by the air. This vain ſcience has alſo come to us from the Pagans: but is rejected by reaſon as well as Chriſtianity, as falſe and abſurd.

6. *Pyromancy* is a divination made by the inſpection of a flame, either by obſerving to which ſide it turns, or by throwing into it ſome combuſtible matter, or a bladder filled with wine, or any thing elſe from which they imagined they were able to predict.

7. *Hydromancy* is the ſuppoſed art of divining by water. The Perſians, according to Varro, invented it; Pythagoras and Numa Pompilius made uſe of it; and we ſtill admire the like wonderful prognoſticaters.

8. *Geomancy* was a divination made by obſerving of cracks or clefts in the earth. It was alſo performed by points made on paper, or any other ſubſtance, at a venture; and they judged of future events from the figures that reſulted from thence. This was certainly very ridiculous; but it is nothing leſs ſo to pretend to predict future events by the inſpection of the grounds of a diſh of tea or coffee, or by cards, and many other like matters.—Thus have deſigning men made uſe of the four elements to deceive their credulous brethren.

9. *Chiromancy* is the art which teaches to know, by inſpecting the hand, not only the inclinations of a man, but his future deſtiny alſo. The fools or impoſtors who practiſe this art pretend, that the different parts or the lines of the hand have a relation to the internal parts of the body, as ſome to the heart, others to the liver, ſpleen, &c. On this falſe ſuppoſition, and on many others equally extravagant, the principles of chiromancy are founded: and on which, however, ſeveral authors, as Robert Flud an Engliſhman, Artemidorus, M. de la Chambre, John of Indagina, and many others, have written large treatiſes.

10. *Phyſiognomy*, or *phyſiognomancy*, is a ſcience that pretends to teach the nature, the temperament, the underſtanding, and the inclinations of men, by the inſpection

ſpection of their countenances, and is therefore very little leſs frivolous than chiromancy; though Ariſtotle, and a number of learned men after him, have written expreſs treatiſes concerning it.

DIVINE, ſomething relating to God. The word is alſo uſed, figuratively, for any thing that is excellent, extraordinary, and that ſeems to go beyond the power of nature and the capacity of mankind. In which ſenſe, the compaſs, teleſcope, clocks, &c. are ſaid to be *divine inventions:* Plato is called the *divine author*, the *divine Plato;* and the ſame appellation is given to Seneca: Hippocrates is called, "the divine old man," *divinus ſenex*, &c.

DIVING, the art or act of deſcending under water to conſiderable depths, and abiding there a competent time.

The uſes of diving are very conſiderable, particularly in the fiſhing for pearls, corals, ſpunges, &c. See *Pearl-Fiſhing*, &c.

There have been various methods propoſed, and machines contrived, to render the buſineſs of diving more ſafe and eaſy. The great point is to furniſh the diver with freſh air; without which, he muſt either make a ſhort ſtay or periſh.

Thoſe who dive for ſpunges in the Mediterranean, help themſelves by carrying down ſpunges dipt in oil in their mouths. But conſidering the ſmall quantity of air that can be contained in the pores of a ſpunge, and how much that little will be contracted by the preſſure of the incumbent water, ſuch a ſupply cannot long ſubſiſt the diver. For it is found by experiment, that a gallon of air included in a bladder, and by a pipe reciprocally inſpired and exſpired by the lungs, becomes unfit for reſpiration in little more than one minute of time. For though its elaſticity be but little altered in paſſing the lungs, yet it loſes its vivifying ſpirit, and is rendered effete.

In effect, a naked diver, Dr Halley aſſures us, without a ſpunge, cannot remain above a couple of minutes incloſed in water, nor much longer with one, without ſuffocating; nor, without long practice, near ſo long; ordinary perſons beginning to ſtifle in about half a minute. Beſides, if the depth be conſiderable, the preſſure of the water in the veſſels makes the eyes blood-ſhotten, and frequently occaſions a ſpitting of blood.

Hence, where there has been occaſion to continue long at the bottom, ſome have contrived double flexible pipes, to circulate air down into a cavity, incloſing the diver as with armour, both to furniſh air and to bear off the preſſure of the water, and give leave to his breaſt to dilate upon inſpiration; the freſh air being forced down one of the pipes with bellows, and returning by the other of them, not unlike to an artery and vein.

But this method is impracticable when the depth ſurpaſſes three fathoms; the water embracing the bare limbs ſo cloſely as to obſtruct the circulation of the blood in them; and withal preſſing ſo ſtrongly on all the junctures where the armour is made tight with leather, that, if there be the leaſt defect in any of them, the water ruſhes in, and inſtantly fills the whole engine, to the great danger of the diver's life.

It is certain, however, that people, by being accuſtomed to the water from their infancy, will at length be enabled, not only to ſtay much longer under water than the time above mentioned, but put on a kind of amphibious nature, ſo that they ſeem to have the uſe of all their faculties as well when their bodies are immerſed in water as when they are on dry land. Moſt ſavage nations are remarkable for this. According to the accounts of our late voyagers, the inhabitants of the South-ſea iſlands are ſuch expert divers, that when a nail or any piece of iron was thrown overboard, they would inſtantly jump into the ſea after it, and never failed to recover it, notwithſtanding the quick deſcent of the metal. Even among civilized nations, many perſons have been found capable of continuing an incredible length of time below water. The moſt remarkable inſtance of this kind is the famous Sicilian diver Nicolo Peſce. The authenticity of the account, indeed, depends entirely on the authority of F. Kircher. He aſſures us, that he had it from the archives of the kings of Sicily: but, notwithſtanding this aſſertion, the whole hath ſo much of the marvellous in it, that we believe there are few who will not look upon it to have been exaggerated. "In the times of Frederic king of Sicily (ſays Kircher), there lived a celebrated diver, whoſe name was *Nicholas*, and who, from his amazing ſkill in ſwimming, and his perſeverance under water, was ſurnamed the *fiſh*. This man had from his infancy been uſed to the ſea; and earned his ſcanty ſubſiſtence by diving for corals and oyſters, which he ſold to the villagers on ſhore. His long acquaintance with the ſea, at laſt, brought it to be almoſt his natural element. He was frequently known to ſpend five days in the midſt of the waves, without any other proviſions than the fiſh which he caught there and ate raw. He often ſwam over from Sicily into Calabria, a tempeſtuous and dangerous paſſage, carrying letters from the king. He was frequently known to ſwim among the gulphs of the Lipari iſlands, noway apprehenſive of danger.

"Some mariners out at ſea, one day obſerved ſomething at ſome diſtance from them, which they regarded as a ſea-monſter; but upon its approach it was known to be Nicholas, whom they took into their ſhip. When they aſked him whither he was going in ſo ſtormy and rough a ſea, and at ſuch a diſtance from land, he ſhowed them a packet of letters, which he was carrying to one of the towns of Italy, exactly done up in a leather bag, in ſuch a manner as that they could not be wetted by the ſea. He kept them thus company for ſome time in their voyage, converſing, and aſking queſtions; and after eating an hearty meal with them, he took his leave, and, jumping into the ſea, purſued his voyage alone.

"In order to aid theſe powers of enduring in the deep, nature ſeemed to have aſſiſted him in a very extraordinary manner: for the ſpaces between his fingers and toes were webbed, as in a gooſe; and his cheſt became ſo very capacious, that he could take in, at one inſpiration, as much breath as would ſerve him for a whole day.

"The account of ſo extraordinary a perſon did not fail to reach the king himſelf; who commanded Nicholas to be brought before him. It was no eaſy matter to find Nicholas, who generally ſpent his time in the ſolitudes of the deep; but, at laſt, after much ſearching, he was found, and brought before his majeſty. The curioſity of this monarch had been long excited by the accounts he had heard of the bottom of the gulph of Charybdis; he now therefore conceived, that it would be a proper opportunity to have more certain information. He therefore commanded our poor diver to examine the bottom of this dreadful whirlpool; and as an incitement to his obedience, he ordered a golden cup to be flung into it. Nicholas was not inſenſible of the danger to which he was expoſed; dangers beſt known only to himſelf; and therefore he preſumed to remonſtrate: but the hopes of the reward, the deſire of pleaſing the king, and the pleaſure of ſhowing his ſkill, at laſt prevailed. He inſtantly jumped into the gulph, and was as inſtantly ſwallowed up in its boſom. He continued for three quarters of an hour below; during which time the king and his attendants remained on ſhore, anxious for his fate; but he at laſt appeared, holding the cup in triumph in one hand, and making his way good among the waves with the other. It may be ſuppoſed he was received with applauſe when he came on ſhore: the cup was made the reward of his adventure; the king ordered him to be taken proper care of; and, as he was ſomewhat fatigued and debilitated by his labour, after an hearty meal he was put to bed, and permitted to refreſh himſelf by ſleeping.

" When his ſpirits were thus reſtored, he was again brought to ſatisfy the king's curioſity with a narrative of the wonders he had ſeen; and his account was to the following effect. He would never, he ſaid, have obeyed the king's commands, had he been appriſed of half the dangers that were before him. There were four things, he ſaid, which rendered the gulph dreadful, not only to men, but to fiſhes themſelves. 1. The force of the water burſting up from the bottom, which required great ſtrength to reſiſt. 2. The abruptneſs of the rocks that on every ſide threatened deſtruction. 3. The force of the whirlpool daſhing againſt thoſe rocks. And, 4. The number and magnitude of the polypous fiſh, ſome of which appeared as large as a man; and which, every where ſticking againſt the rocks, projected their fibrous arms to entangle him. Being aſked how he was able ſo readily to find the cup that had been thrown in, he replied, that it happened to be flung by the waves into the cavity of a rock againſt which he himſelf was urged in his deſcent. This account, however, did not ſatisfy the king's curioſity. Being requeſted to venture once more into the gulph for further diſcoveries, he at firſt refuſed: but the king, deſirous of having the moſt exact information poſſible of all things to be found in the gulph, repeated his ſolicitations; and, to give them ſtill greater weight, produced a larger cup than the former, and added alſo a purſe of gold. Upon theſe conſiderations the unfortunate diver once again plunged into the whirlpool, and was never heard of more."

To obviate the inconveniences of diving to thoſe who have not the extraordinary powers of the diver above mentioned, different inſtruments have been contrived. The chief of theſe is the diving bell; which is moſt conveniently made in form of a truncated cone, the ſmaller baſe being cloſed, and the larger open. It is to be poiſed with lead; and ſo ſuſpended, that the veſſel may ſink full of air, with its open baſis downward, and as near as may be in a ſituation parallel to the horizon, ſo as to cloſe with the ſurface of the water all at once.

Under this covercle the diver ſitting, ſinks down with the included air to the depth deſired: and if the cavity of the veſſel can contain a tun of water, a ſingle man may remain a full hour, without much inconvenience, at five or ſix fathoms deep. But the lower you go, ſtill the included air contracts itſelf according to the weight of the water which compreſſes it: ſo that at 33 feet deep the bell becomes half full of water, the preſſure of the incumbent water being then equal to that of the atmoſphere; and at all other depths the ſpace occupied by the compreſſed air in the upper part of the bell will be to the under part of its capacity filled with water, as 33 feet to the ſurface of the water in the bell below the common ſurface thereof. And this condenſed air being taken in with the breath ſoon inſinuates itſelf into all the cavities of the body, and has no ill effect, provided the bell be permitted to deſcend ſo ſlowly as to allow time for that purpoſe. One inconvenience that attends it, is found in the ears, within which there are cavities which open only outwards, and that by pores ſo ſmall as not to give admiſſion even to the air itſelf, unleſs they be dilated and diſtended by a conſiderable force. Hence, on the firſt deſcent of the bell, a preſſure begins to be felt on each ear; which, by degrees, grows painful, till the force overcoming the obſtacle, what conſtringes theſe pores yields to the preſſure, and letting ſome condenſed air ſlip in, preſently eaſe enſues. The bell deſcending lower, the pain is renewed, and again eaſed in the ſame manner.

But the greateſt inconvenience of this engine is, that the water entering it, contracts the bulk of air into ſo ſmall a compaſs, that it ſoon heats and becomes unfit for reſpiration: ſo that there is a neceſſity for its being drawn up to recruit it; beſides the uncomfortable abiding of the diver almoſt covered with water.

To obviate the difficulties of the diving-bell, Dr Halley, to whom we owe the preceding account, contrived ſome further apparatus, whereby not only to recruit and refreſh the air from time to time, but alſo to keep the water wholly out of it at any depth. The manner in which this was effected, he relates in the following words.

" The bell I made uſe of was of wood, containing about 60 cubic feet in its concavity; and was of the form of a truncate cone, whoſe diameter at the top was three feet, and at the bottom five. This I coated with lead ſo heavy that it would ſink empty; and I diſtributed the weight ſo about its bottom, that it would go down in a perpendicular direction, and no other. In the top I fixed a ſtrong but clear glaſs, as a window, to let in the light from above; and likewiſe a cock to let out the hot air that had been breathed: and below, about a yard under the bell, I placed a ſtage which hung by three ropes, each of which was charged with about one hundred weight to keep it ſteady. This machine I ſuſpended from the maſt of a ſhip by a ſprit, which was ſufficiently ſecured by ſtays to the maſthead, and was directed by braces to carry it overboard clear of the ſhip's ſide, and to bring it again within board as occaſion required.

Plate CLXIII.

*Fig. 1. Haly's Diving Bell*

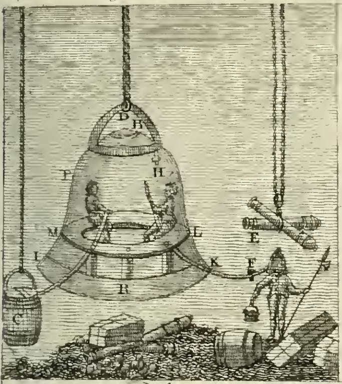


*Fig. 2 Triewald's.*

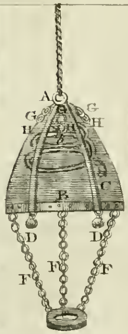


*Fig. 3. Spalding's.*

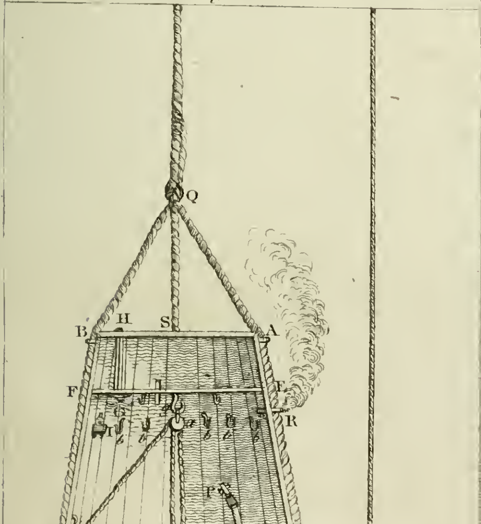
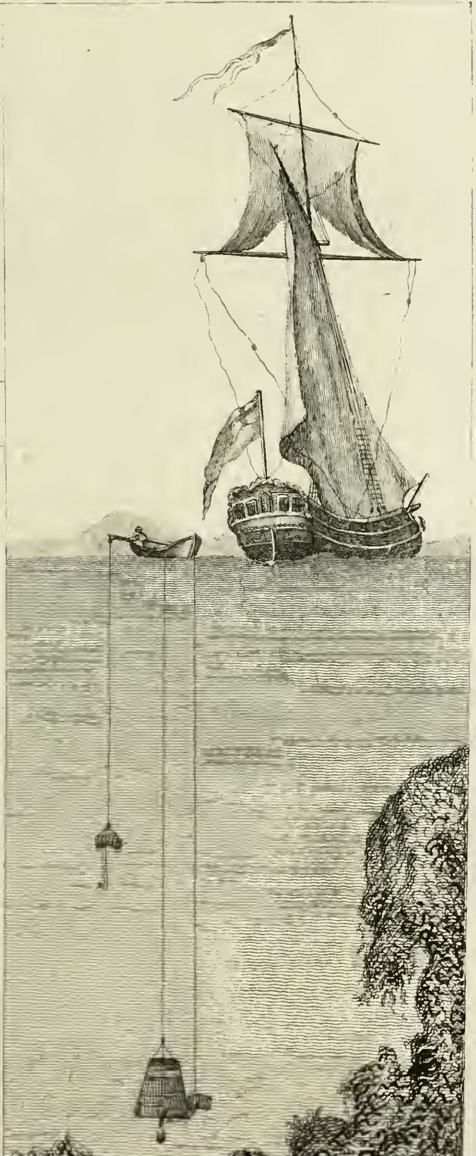


*Fig. 4.*



A. Bell Prin. Wal. Sculptor fecit.

“ To ſupply air to this bell when under water, I cauſed a couple of barrels of about 36 gallons each to be caſed with lead, ſo as to ſink empty ; each of them having a bung-hole in its loweſt parts to let in the water, as the air in them condenſed on their deſcent ; and to let it out again when they were drawn up full from below. And to a hole in the uppermoſt part of theſe barrels, I fixed a leathern trunk or hoſe well liquored with bees wax and oil, and long enough to fall below the bung-hole, being kept down by a weight appended : ſo that the air in the upper part of the barrels could not eſcape, unleſs the lower ends of theſe hoſe were firſt lifted up.

“ The air-barrels being thus prepared, I fitted them with tackle proper to make them riſe and fall alternately, after the manner of two buckets in a well ; which was done with ſo much eaſe, that two men, with leſs than half their ſtrength, could perform all the labour required : and in their deſcent they were directed by lines faſtened to the under edge of the bell, the which paſſed through rings on both ſides the leathern hoſe in each barrel ; ſo that, ſliding down by theſe lines, they came readily to the hand of a man who ſtood on the ſtage on purpoſe to receive them, and to take up the ends of the hoſe into the bell. Through theſe hoſe, as ſoon as their ends came above the ſurface of the water in the barrels, all the air that was included in the upper parts of them was blown with great force into the bell ; whilſt the water entered at the bung-holes below, and filled them : and as ſoon as the air of one barrel had been thus received, upon a ſignal given, that was drawn up, and at the ſame time the other deſcended ; and, by an alternate ſucceſſion, furniſhed air ſo quick, and in ſo great plenty, that I myſelf have been one of five who have been together at the bottom in nine or ten fathom water, for above an hour and an half at a time, without any ſort of ill conſequence : and I might have continued there as long as I pleaſed, for any thing that appeared to the contrary. Beſides, the whole cavity of the bell was kept entirely free from water, ſo that I ſat on a bench which was diametrically placed near the bottom, wholly dreſſed, with all my cloaths on. I only obſerved, that it was neceſſary to be let down gradually at firſt, as about 12 feet at a time ; and then to ſtop and drive out the air that entered, by receiving three or four barrels of freſh air before I deſcended further. But being arrived at the depth deſigned, I then let out as much of the hot air that had been breathed, as each barrel would repleniſh with cool, by means of the cock at the top of the bell ; through whoſe aperture, though very ſmall, the air would ruſh with ſo much violence, as to make the ſurface of the ſea boil, and to cover it with a white foam, notwithſtanding the weight of the water over us.

“ Thus I found that I could do any thing that required to be done juſt under us ; and that, by taking off the ſtage, I could, for a ſpace as wide as the circuit of the bell, lay the bottom of the ſea ſo far dry, as not to be overſhoes thereon. And, by the glaſs window, ſo much light was tranſmitted, that when the ſea was clear, and eſpecially when the ſun ſhone, I could ſee perfectly well to write or read ; much more to faſten or lay hold on any thing under us that was to be taken up. And, by the return of the air-barrels, I often ſent up orders written with an iron pen, on ſmall plates of lead, directing how to move us from place to place as occaſion required. At other times, when the water was troubled and thick, it would be as dark as night below ; but in ſuch caſes I have been able to keep a candle burning in the bell as long as I pleaſed, notwithſtanding the great expence of air neceſſary to maintain flame.—By an additional contrivance, I have found it not impracticable for a diver to go out of an engine to a good diſtance from it, the air being conveyed to him with a continued ſtream, by ſmall flexible pipes ; which pipes may ſerve as a clue, to direct him back again when he would return to the bell.”

Plate CLXIII. fig. 1. ſhows Dr Halley's diving bell, with the divers at work. DBLKRIMP repreſents the body of the bell. D, the glaſs which ſerves as a window. B, the cock for letting out the air which has been breathed. LM, the ſeats. C, one of the air-barrels. P, H, two of the divers. F, another diver at a diſtance from the bell, and breathing through the flexible tube K.—This diver is ſuppoſed to have a head-piece of lead, made to fit quite cloſe about his ſhoulders : this head-piece was capable of containing as much air as would ſupply him for a minute or two. When he had occaſion for more air, he turned a cock at F, by which means a communication was opened with the air in the bell, and thus he could receive a new ſupply at pleaſure.

Since the invention of this diving machine, there has been one contrived by Mr Triewald, F. R. S. and military architect to the king of Sweden, which, for a ſingle perſon, is in ſome reſpects thought to be more eligible than Dr Halley's, and is conſtructed as follows. AB is the bell, which is ſunk by lead weights Fig. 2. DD hung to its bottom. This bell is of copper, and tinned all over in the inſide, which is illuminated by three ſtrong convex lenſes, G, G, G, with copper lids H, H, H, to defend them. The iron ring or plate E ſerves the diver to ſtand on when he is at work ; and is ſuſpended at ſuch a diſtance from the bottom of the bell by the chains F, F, F, that when the diver ſtands upright, his head is juſt above the water in the bell, where the air is much better than higher up, becauſe it is colder, and conſequently more fit for reſpiration. But as the diver muſt always be within the bell, and his head of courſe in the upper part, the inventor has contrived, that even there, when he has breathed the hot air as well as he can, he may, by means of a ſpiral copper tube *bc*, placed cloſe to the inſide of the bell, draw the cooler and freſher air from the lowermoſt parts : for which purpoſe, a flexible leather tube, about two feet long, is fixed to the upper end of the copper tube at *b* ; and to the other end of this tube is fixed an ivory mouth-piece, by which the diver draws in the air.

The greateſt improvement, however, which the diving bell ever received, or probably can receive, was from the late Mr Spalding of Edinburgh. A ſection of his improved diving-bell is repreſented in fig. 3. This con- Fig. 3. ſtruction is deſigned to remedy ſome inconveniences of Dr Halley's, which are very evident, and of very dangerous tendency. Theſe are, 1. By Dr Halley's conſtruction, the ſinking or raiſing of the bell depends entirely on the people who are at the ſurface of the water; and as the bell even when in the water has a very conſiderable weight, the raiſing it not only requires a great deal of labour, but there is a poſſibility of the rope breaking by which it is raiſed, and thus every perſon in the bell would inevitably periſh. 2. As there are, in many places of the ſea, rocks which lie at a conſiderable depth, the figure of which cannot poſſibly be perceived from above, there is danger that ſome of their ragged prominences may catch hold of one of the edges of the bell in its deſcent, and thus overſet it before any ſignal can be given to thoſe above, which would infallibly be attended with the deſtruction of the people in the bell: and as it muſt always be unknown, before trial, what kind of a bottom the ſea has in any place, it is plain, that without ſome contrivance to obviate this laſt danger, the deſcent in Dr Halley's diving-bell is not at all eligible.

How theſe inconveniences are remedied by Mr Spalding's new conſtruction will be eaſily underſtood from the following deſcription.—ABCD repreſents a ſection of the bell, which is made of wood; *e*, *e*, are iron hooks, by means of which it is ſuſpended by ropes QBF*e*, and QAER*e*, and QS, as expreſſed in the figure: *c*, *c*, are iron hooks, to which are appended lead weights, that keep the mouth of the bell always parallel to the ſurface of the water, whether the machine taken altogether is lighter or heavier than an equal bulk of water. By theſe weights alone, however, the bell would not ſink: another is therefore added, repreſented at L; and which can be raiſed or lowered at pleaſure, by means of a rope paſſing over the pulley *a*, and faſtened to one of the ſides of the bell at M. As the bell deſcends, this weight, called by Mr Spalding the *balance weight*, hangs down a conſiderable way below the mouth of the bell. In caſe the edge of the bell is catched by any obſtacle, the balance-weight is immediately lowered down ſo that it may reſt upon the bottom. By this means the bell is lightened ſo that all danger of overſetting is removed; for being lighter, without the balance-weight, than an equal bulk of water, it is evident that the bell will riſe, as far as the length of the rope affixed to the balance-weight will allow it. This weight, therefore, will ſerve as a kind of anchor to keep the bell at any particular depth which the divers may think neceſſary; or by pulling it quite up, the deſcent may be continued to the very bottom.

By another very ingenious contrivance, Mr Spalding rendered it poſſible for the divers to raiſe the bell, with all the weights appended to it, even to the ſurface, or to ſtop at any particular depth, as they think proper; and thus they could ſtill be ſafe, even though the rope deſigned for pulling up the bell was broke. For this purpoſe the bell is divided into two cavities, both of which are made as tight as poſſible. Juſt above the ſecond bottom EF, are ſmall ſlits in the ſides of the bell; through which the water, entering as the bell deſcends, diſplaces the air originally contained in this cavity, which flies out at the upper orifice of the cock GH. When this is done, the divers turn the handle G, which ſtops the cock; ſo that if any more air was to get into the cavity AEFB, it could not longer be diſcharged through the orifice H as before. When this cavity is full of water, the bell ſinks; but when a conſiderable quantity of air is admitted, it riſes. If therefore the divers have a mind to raiſe themſelves, they turn the ſmall cock *g*, by which a communication is made between the upper and under cavities of the bell. The conſequence of this is, that a quantity of air immediately enters the upper cavity, forces out a quantity of the water contained in it, and thus renders the bell lighter by the whole weight of the water which is diſplaced. Thus, if a certain quantity of air is admitted into the upper cavity, the bell will deſcend very ſlowly; if a greater quantity, it will neither aſcend nor deſcend, but remain ſtationary; and if a larger quantity of air is ſtill admitted, it will ariſe to the top. It is to be obſerved, however, that the air which is thus let out into the upper cavity muſt be immediately replaced from the air-barrel; and the air is to be let out very ſlowly, or the bell will riſe to the top with ſo great velocity that the divers will be in danger of being ſhaken out of their ſeats. But, by following theſe directions, every poſſible accident may be prevented, and people may deſcend to great depths without the leaſt apprehenſion of danger. The bell alſo becomes ſo eaſily manageable in the water, that it may be conducted from one place to another by a ſmall boat with the greateſt eaſe, and with perfect ſafety to thoſe who are in it.

Inſtead of wooden ſeats uſed by Dr Halley, Mr Spalding made uſe of ropes ſuſpended by hooks *bbb*; and on theſe ropes the divers may ſit without any inconvenience. I and K are two windows made of thick ſtrong glaſs, for admitting light to the divers. N repreſents an air-caſk with its tackle, and OCP the flexible pipe through which the air is admitted to the bell. In the aſcent and deſcent of this caſk the pipe is kept down by a ſmall weight appended, as in Dr Halley's machine. R is a ſmall cock by which the hot air is diſcharged as often as it becomes troubleſome. Fig. 4. is a repreſentation of the whole diving apparatus, which it is hoped will be readily underſtood without any further explanation. Two air-barrels are repreſented in this figure; but Mr Spalding was of opinion, that one capable of containing 30 gallons is ſufficient for an ordinary machine.

Fig.

We are told of another method put in practice by a gentleman of Devonſhire. He has contrived a large caſe of ſtrong leather, perfectly water-proof, which may hold about half a hogſhead of air. This is ſo contrived, that, when he ſhuts himſelf up in this caſe, he may walk at the bottom of the ſea, and go into any part of a wrecked veſſel, and deliver out the goods. This method, we are told, he has practiſed for many years, and has thus acquired a large fortune. It would be a conſiderable improvement on this machine to condenſe the air in it as much as poſſible before the diver deſcended; as he would thus be furniſhed with an atmoſphere endued with elaſticity ſufficient to reſiſt the weight of the water, which otherwiſe would ſqueeze his caſe into much leſs room than it originally took up. The condenſed air alſo would ſerve for reſpiration a much-longer time than that which is in its ordinary ſtate.

*Diving-Bladder*, a machine invented by Borelli, and by him preferred, though without any good reaſon, to the diving-bell. It is a globular veſſel of braſs or copper, about two feet in diameter, which contains the diver's head. It is fixed to a goat's-ſkin habit exactly fitted to his perſon. Within the veſſel are pipes; by means of which a circulation of air is contrived; and the perſon carries an air-pump by his ſide, by which he can make himſelf heavier or lighter as fiſhes do, by contracting or dilating their air bladder. By this means he thought all the objections to which other diving machines are liable were entirely obviated, and particularly that of want of air; the air which had been breathed, being, as he imagined, deprived of its noxious qualities by circulating through the pipes. Theſe advantages, however, it is evident, are only imaginary. The diver's limbs, being defended from the preſſure of the water only by a goat's-ſkin, would infallibly be cruſhed if he deſcended to any conſiderable depth; and from the diſcoveries now made by Dr Prieſtley and others, it is abundantly evident, that air, which is once rendered foul by breathing, cannot in any degree be reſtored by circulation through pipes. Concerning the uſe of copper machines in general, Mr Spalding favoured us with the following curious obſervation, namely, That when a perſon has breathed in them a few minutes, he feels in his mouth a very diſagreeable braſſy taſte, which continues all the time he remains in the veſſel; ſo that, on this account, copper ſeems by no means an eligible material. This taſte moſt probably ariſes from the action of the alkaleſcent effluvia of the body upon the copper; for volatile alkali is a ſtrong diſſolvent of this metal: but how theſe effluvia volatiliſe the copper in ſuch a manner as to make the taſte of it ſenſible in the mouth, it is not eaſy to ſay.

DIVINITY, properly ſignifies the nature, quality, and eſſence of God.

Divinity, is alſo uſed in the ſame ſenſe with theology.

DIVISIBILITY, that property by which the particles of matter in all bodies are capable of a ſeparation or diſunion from each other.

The Peripatetics and Carteſians hold diviſibility to be an affection of all matter. The Epicureans, again, allow it to agree to every phyſical continuum; but they deny that this affection agrees to all bodies, for the primary corpuſcles or atoms they maintain to be perfectly inſecable and indiviſible.

As it is evident that body is extended, ſo it is no leſs evident that it is diviſible: for ſince no two particles of matter can exiſt in the ſame place, it follows, that they are really diſtinct from each other; which is all that is meant by being diviſible. In this ſenſe the leaſt conceivable particle muſt ſtill be diviſible, ſince it will conſiſt of parts which will be really diſtinct. To illuſtrate this by a familiar inſtance. Let the leaſt imaginable piece of matter be conceived lying on a ſmooth plain ſurface, it is evident the ſurface will not touch it every where: thoſe parts therefore which it does not touch may be ſuppoſed ſeparable from the others, and ſo on as far as we pleaſe; and this is all that is meant when we ſay matter is infinitely diviſible.

The infinite diviſibility of mathematical quantity is demonſtrated thus geometrically. Suppoſe the line AC perpendicular to BF; and another, as GH, at a ſmall diſtance from it, alſo perpendicular to the ſame line: with the centres CCC, &c. deſcribe circles cutting the line GH in the points *eee*, &c. Now the greater the radius AC is, the leſs is the part *e*H. But the radius may be augmented in infinitum; ſo long, therefore, the part *e*H may be divided into ſtill leſs portions; conſequently it may be divided in infinitum.

Diviſibility, Diviſion.

All that is ſuppoſed in ſtrict geometry (ſays Mr Maclaurin) concerning the diviſibility of magnitude, amounts to no more than that a given magnitude may be conceived to be divided into a number of parts equal to any given or propoſed number. It is true, that the number of parts into which a given magnitude may be conceived to be divided, is not to be fixed or limited, becauſe no given number is ſo great but a greater may be conceived and aſſigned: but there is not, therefore, any neceſſity of ſuppoſing the number of parts actually infinite; and if ſome have drawn very abſtruſe conſequences from ſuch a ſuppoſition, yet geometry ought not to be loaded with them.

How far matter may actually be divided, may in ſome meaſure be conceived from hence, that a piece of wire gilt with ſo ſmall a quantity as eight grains of gold, may be drawn out to a length of 13,000 feet, the whole ſurface of it ſtill remaining covered with gold. We have alſo a ſurpriſing inſtance of the minuteneſs of ſome parts of matter from the nature of light and viſion. Let a candle be lighted, and placed in an open plain, it will then be viſible two miles round; and conſequently was it placed two miles above the ſurface of the earth, it would fill with luminous particles a ſphere whoſe diameter was four miles, and that before it had loſt any ſenſible part of its weight. A quantity of vitriol being diſſolved, and mixed with 9000 times as much water, will tinge the whole; conſequently will be divided into as many parts as there are viſible portions of matter in that quantity of water. There are perfumes, which, without a ſenſible diminution of their quantity, ſhall fill a very large ſpace with their odoriferous particles; which muſt therefore be of an inconceivable ſmallneſs, ſince there will be a ſufficient number in every part of that ſpace ſenſibly to affect the organ of ſmelling. Dr Keill demonſtrates, that any particle of matter, how ſmall ſoever, and any finite ſpace, how large ſoever, being given, it is poſſible for that ſmall particle of matter to be diffuſed through all that ſpace, and to fill it in ſuch a manner, as that there ſhall be no pore in it whoſe diameter ſhall exceed any given line.

The chief objections againſt the diviſibility of matter in infinitum are, That an infinite cannot be contained by a finite; and that it follows from a diviſibility in infinitum, either that all bodies are equal, or that one infinite is greater than another. But the anſwer to theſe is eaſy; for the properties of a determined quantity are not to be attributed to an infinite conſidered in a general ſenſe; and who has ever proved that there could not be an infinite number of infinitely ſmall parts in a finite quantity, or that all infinites are equal? The contrary is demonſtrated by mathematicians in innumerable inſtances. See the article Infinite, and 'S *Graveſande Elem. Mathem.* l. i. c. 4.

DIVISION, in general, is the ſeparating a thing into two or more parts.

*Mechanical* Division, ſignifies that ſeparation which is occaſioned in the parts of a body by help of mechanical inſtruments.—The mechanical diviſion of bodies does

does indeed ſeparate them into ſmaller, homogeneous, ſimilar parts; but this ſeparation cannot extend to the primary integrant molecules of any body; and conſequently is incapable of breaking what is properly called their *aggregation:* alſo, no union is formed betwixt the divided and dividing bodies, in which reſpect diviſion eſſentially differs from diſſolution.

Diviſion is not properly a chemical operation. It is only employed preparatorily to facilitate other operations, and particularly ſolution. For this purpoſe it is very uſeful, as it increaſes the quantity of ſurface, and conſequently the points of contact of any body.—Different methods are uſed to divide bodies according to their nature. Thoſe which are tenacious and elaſtic, as horns and gums, require to be cut, raſped, or filed. Metals, becauſe of their ductility, require the ſame treatment: but as they are alſo fuſible, they may be quickly and conveniently reduced into grains ſmall enough for moſt operations, by pouring them, when melted, into water. All brittle bodies may be reduced conveniently into fine parts by being bruiſed in a mortar with a peſtle. Very hard bodies, ſuch as glaſs, cryſtals, ſtones, particularly thoſe of the vitrifiable kind, before they are pounded, ought to be plunged when red-hot into water, by which they are ſplit and cracked, and rendered more eaſily pulverable. Bodies of this kind may alſo be bruiſed or ground by means of a hard and flat ſtone, upon which the matter is to be put, and bruiſed by another hard ſtone ſo ſmall as to be held and moved upon the larger ſtone with the hand. The larger ſtone is called a *porphyry*, from its being generally of that kind of ſtone; and the operation is called *porphyriſation*. Inſtead of porphyriſation, a mill may be uſed, compoſed of a hard grit millſtone, moving round upon another ſtone of the ſame kind, which muſt be fixed: in the upper ſtone is a groove or channel, through which the matter to be ground paſſes. By this method a ſubſtance may be more quickly reduced to a fine powder than by porphyriſation. But theſe mills can be only employed for conſiderable quantities of matter.

Theſe methods of mechanically dividing bodies are attended with ſome practical inconveniences; the moſt conſiderable of which is, that ſome parts of the dividing inſtruments are always ſtruck off, and mixed with the matter to be divided. This may greatly affect the operations. For inſtance, inſtruments of iron and copper furniſh metallic colouring particles, and copper is very prejudicial to health. Porphyry is coloured by a reddiſh brown matter, which injures the colour of cryſtal glaſſes, enamels, and porcelains made with matters ground upon this ſtone. Theſe matters therefore muſt be cleanſed after their porphyriſation, or elſe no inſtruments capable of injuring the intended operations ought to be employed. Thus, for the preparation of all medicines to be taken internally, no copper inſtruments, as mortars, peſtles, &c. ought to be uſed; thoſe made of iron are preferable; and inſtead of porphyries, mortars, grinding-ſtones and millſtones made of hard and white ſtones ought to be employed for ſubſtances which are to enter into the compoſition of enamels, cryſtal glaſs, and porcelain, the whiteneſs of which is a moſt neceſſary quality.

DIVISION, in algebra. See ALGEBRA, p. 402. N° 102.

DIVISION, in arithmetic. See ARITHMETIC, n° 11.

*DIVISIONS of an Army*, in the military art, the ſeveral brigades and ſquadrons into which it is cantoned.

*DIVISIONS of a Battalion*, are the ſeveral platoons into which it is divided in marching or firing, each of which is commanded by an officer.

DIVISION, in ſea affairs, a ſelect number of ſhips in a fleet or ſquadron of men of war, diſtinguiſhed by a particular flag or pendant, and uſually commanded by a general officer. A ſquadron is commonly ranged into three diviſions, the commanding officer of which is always ſtationed in the centre.

When a fleet conſiſts of 60 ſail of the line, that is, of ſhips having at leaſt 60 cannon each, the admiral divides it into three ſquadrons, each of which has its diviſions and commanding officers. Each ſquadron has its proper colours, according to the rank of the admiral who commands it, and every diviſion its proper maſt. Thus the white flag denotes the firſt diviſion of France; the white and blue the ſecond; and the third is characteriſed by the blue. In Britain, the firſt admiral, or the admiral of the fleet, diſplays the union-flag at the main-top-maſt head; next follows the white flag with St George's croſs; and afterwards the blue. The private ſhips carry pendants of the ſame colour with their reſpective ſquadrons at the maſt of their particular diviſions; ſo that the laſt ſhip in the diviſion of the blue ſquadron carries a blue pendant at her mizen-top-maſt head.

DIVISOR, in arithmetic. See ARITHMETIC, n° 11.

DIUM (anc. geog.), a town of Chalcidice in Macedonia, near mount Athos. Alſo a promontory of Crete, on the north ſide of the iſland.—A third *Dium*, a promontory of Eubœa; or a town of that name in Eubœa, near the promontory Cenæum, on the north-weſt ſide of the iſland, called alſo *Dia*.—A fourth *Dium* in Pieria of Macedonia, on the weſt ſide of the Sinus Thermaicus. Strabo and Livy place it on the borders of Pieria to the ſouth, at the foot of mount Olympus towards Theſſaly. That it was a ſplendid city, appears from Polybius; who relates, that its gymnaſium and walls were overthrown by the Ætolians. From which overthrow, however, it again recovered, Alexander adding new ſplendor to it, by the braſs ſtatues caſt by Lyſippus, and erected there in memory of the ſlain at the Granicus: an ornament which was continued down to the time of the Romans; who made it a colony, called *Dienſis*.—A fifth *Dium* beyond Jordan, near Pella in the Piræa.

DIVODURUM (anc. geog.), a town of the Mediomatrici in Gallia Belgica; ſituated on the Moſelle, in the ſpot where now Metz ſtands: now a city of Lorrain. E. Long. 6. 0. Lat. 49. 16.

DIVORCE, a breach or diſſolution of the bond of marriage. See MARRIAGE; and LAW, N° clx. 23.

Divorce is of two kinds: the one, *a vinculo matrimonii*, which alone is properly *divorce*; the other, *a menſa & thoro*, "a ſeparation from bed and board."

The woman divorced *a vinculo matrimonii* receives all again that ſhe brought with her: the other has a ſuitable ſeparate maintenance allowed her out of her huſband's effects. The firſt only happens thro' ſome eſſential impediment, as conſanguinity or affinity within the degrees forbidden, pre-contract, impotency, adultery, &c. of which impediments the canon law allows 14, comprehended in theſe verſes:

*Error, conditio, votum, cognatio, crimen,*
*Cultus, diſparitas, vis, ordo, ligamen, honeſtas,*
*Si ſis affinis, ſi forte coire nequibis,*
*Si parochi & duplicis deſit præſentia teſtis,*
*Raptave ſit mulier, nec parti reddita tuta.*

Divorce is a ſpiritual judgment, and therefore is paſſed in the ſpiritual court. Under the old law, the woman divorced was to have of her huſband a writing, as St Jerom and Joſephus teſtify, to this effect: *I promiſe, that hereafter I will lay no claim to thee;* which was called a *bill of divorce.*

Divorce was allowed of in great latitude both among the pagans and Jews. At Rome, barrenneſs, age, diſeaſe, madneſs, and baniſhment, were the ordinary cauſes of divorce. Spurius Carvilius, between 500 and 600 years after the building of Rome, under the conſulſhip of M. Attilius, and P. Valerius, was the firſt who put away his wife becauſe ſhe was barren; though Plutarch, in his Roman Queſtions, maintains, that Domitian was the firſt who permitted divorce. Juſtinian afterwards added impotence, a vow of chaſtity, and the profeſſion of a monaſtic life, as valid reaſons of divorce.

The Roman lawyers diſtinguiſh between *repudium* and *divortium;* making the former to be the breaking of a contract or eſpouſal, and the latter ſeparation after matrimony. Romulus enacted a ſevere law, which ſuffered not a wife to leave her huſband, but gave the man the liberty of turning off his wife, either upon poiſoning her children, counterfeiting his private keys, or for the crime of adultery; but if the huſband on any other occaſion put her away, he ordered one moiety of his eſtate for the wife, and the other to the goddeſs Ceres: beſides an atonement to the gods of the earth. However, in later times, the women as well as the men might ſue a divorce. The common way of divorcing was by ſending a bill to the woman, containing the reaſons of ſeparation, and the tender of all her goods which ſhe brought with her: and this was called *repudium mittere;* or elſe it was performed in her preſence, and before ſeven witneſſes, and accompanied with the formalities of tearing the writings, refunding the portion, taking away the keys, and turning the woman out of doors.

The Grecian laws concerning divorces were different: The Cretans allowed divorce to any man that was afraid of having too many children. The Spartans ſeldom divorced their wives; and it was extremely ſcandalous for a woman to depart from her huſband. The Athenians allowed divorce on very ſmall grounds, by a bill, containing the reaſon of the divorce, and approved, if the party appealed, by the chief magiſtrate; and women alſo were allowed to leave their huſbands on juſt occaſions. Perſons divorcing their wives were obliged to return their portions; otherwiſe, the Athenian laws obliged them to pay nine oboli a month for alimony. The terms expreſſing the ſeparation of men and women from each other were different; the men were ſaid αποπεμπειν or απολυειν, *to diſmiſs their wives;* but wives, απολειπειν, *to leave their huſbands.*

"The law of Moſes (Mr Paley obſerves), for reaſons of local expediency, permitted the Jewiſh huſband to put away his wife; but whether for every cauſe, or for what cauſe, appears to have been controverted amongſt the interpreters of thoſe times. Chriſt, the precepts of whoſe religion were calculated for more general uſe and obſervation, revokes this permiſſion, as given to the Jews 'for their hardneſs of hearts,' and promulges a law which was thenceforward to confine divorces to the ſingle cauſe of adultery in the wife: 'Whoſoever ſhall put away his wife, except it be for fornication, and ſhall marry another, committeth adultery; and who ſo marrieth her which is put away, doth commit adultery.' Matt. xix. 9.

*Paley's Moral and Political Philoſophy,* p. 273.

"Inferior cauſes may juſtify the ſeparation of huſband and wife, although they will not authoriſe ſuch a diſſolution of the marriage contract as would leave either at liberty to marry again: for it is that liberty in which the danger and miſchief of divorces principally conſiſt. The law of this country, in conformity to our Saviour's injunction, confines the diſſolution of the marriage contract to the ſingle caſe of adultery in the wife; and a divorce even in that caſe can only be brought about by the operation of an act of parliament, founded upon a previous ſentence in the ſpiritual court, and a verdict againſt the adulterer at common law: which proceedings taken together compoſe as complete an inveſtigation of the complaint as a cauſe can receive. It has lately been propoſed to the legiſlature to annex a clauſe to theſe acts, reſtraining the offending party from marrying with the companion of her crime, who by the courſe of proceeding is always known and convicted: for there is reaſon to fear, that adulterous connections are often formed with the proſpect of bringing them to this concluſion; at leaſt, when the ſeducer has once captivated the affection of a married woman, he may avail himſelf of this tempting argument to ſubdue her ſcruples, and complete his victory; and the legiſlature, as the buſineſs is managed at preſent, aſſiſts by its interpoſition the criminal deſign of the offenders, and confers a privilege where it ought to inflict a puniſhment. The propoſal deſerved an experiment; but ſomething more penal, it is apprehended, would be found neceſſary to check the progreſs of this alarming depravity. Whether a law might not be framed, directing *the fortune of the adultereſs to deſcend as in caſe of her natural death;* reſerving, however, a certain proportion of the produce of it, by way of annuity, for her ſubſiſtence (ſuch annuity in no caſe to exceed a certain ſum); and alſo ſo far ſuſpending the eſtate in the hands of the heir, as to preſerve the inheritance to any children ſhe might bear to a ſecond marriage, in caſe there was none to ſucceed in the place of their mother by the firſt: whether ſuch a law would not render female virtue in higher life leſs vincible, as well as the ſeducers of that virtue leſs urgent in their ſuit, I would recommend to the deliberation of thoſe who are willing to attempt the reformation of this important but moſt incorrigible claſs of the community. A paſſion for ſplendor, for expenſive amuſements and diſtinctions, is commonly found in that deſcription of women who would become the ſubjects of ſuch a law, not leſs inordinate than their other appetites. A ſeverity of the kind propoſed applies immediately to that paſſion. And there is no room for any complaint of injuſtice, ſince the proviſions

ſions above ſtated, with others which might be contrived, confine the puniſhment, ſo far as it is poſſible, to the perſon of the offender; ſuffering the eſtate to remain to the heir, or within the family of the anceſtor from whom it came, or to attend the appointments of his will.

"Sentences of the eccleſiaſtical courts, which releaſe the parties *a vinculo matrimonii*, by reaſon of impuberty, frigidity, conſanguinity within the prohibited degrees, prior marriage, or want of the requiſite conſent of parents or guardians, are not diſſolutions of the marriage contract, but judicial declarations that there never was any marriage; ſuch impediment ſubſiſting at the time as rendered the celebration of the marriage rite a mere nullity. And the rite itſelf contains an exception of theſe impediments. The man and woman to be married are charged, "if they know any impediment why they may not be lawfully joined together, to confeſs it;" and aſſured, "that ſo many as are coupled together, otherwiſe than God's word doth allow, are not joined together by God, neither is their matrimony lawful;" all which is intended by way of ſolemn notice to the parties, that the vow they are about to make will bind their conſciences and authoriſe their cohabitation only upon the ſuppoſition that no legal impediment exiſt."

DIURETICS (from δια *by*, and ουρον *urine*), medicines which provoke a diſcharge by urine.

Such is water drank plentifully; white wine drank in a morning; alkali ſalts of all kinds; ſea-ſalt, ſal-gemmæ, nitre, borax, alum, tartar, ſal ammoniac, whey, ſour milk, lemon-juice, &c. Aqueous liquors are generally diuretic eſpecially if mixed with ſalt, and drank cold. Fermented liquors are the leaſt diuretic of all; and the leſs ſo, as they are the fatter. Sharp thin ſour wines, rheniſh, &c. as alſo acid ſpirits of vinegar, ſalt, ſulphur, alum, vitriol, &c. aſparagus, bitter almonds, ſmallage, eryngium, eupatorium, ſaſſafras, &c. are all diuretics.

DIURNAL, in aſtronomy, ſomething relating to day; in oppoſition to *nocturnal*, which regards the night.

DIVUS, Diva, in antiquity, appellations given to men and women who had been deified, or placed in the number of the gods. See Deification, &c.

Hence it is, that on medals ſtruck for the conſecration of an emperor or empreſs, they give them the title of *divus* or *diva*: for example, DIVUS JULIUS. DIVO ANTONINO PIO. DIVO PIO. DIVO CLAUDIO. DIVA FAUSTINA AUG. &c.

DIZZINESS, in medicine. See Vertigo.

DO, in muſic, a note of the Italian ſcale, correſponding to *ut* of the common gamut. See Music.

DOBSON (William), an eminent Engliſh portrait and hiſtory painter, born at London in 1610. He ſerved an apprenticeſhip with one Peck, a ſtationer and picture-dealer; and owed his improvement to the copying ſome pictures of Titian and Van Dyck, whoſe manner he always retained. He had farther obligations to the latter of theſe artiſts; for it is ſaid, that a picture of his painting being expoſed at a ſhop on Snow-hill, Van Dyck paſſing by was ſtruck with it exceedingly; and inquiring after the author, found him at work in a poor garret. Van Dyck had the generoſity to equip him in a manner ſuitable to his merit. He preſented him to king Charles I. who took him under his protection, kept him with him at Oxford all the time his majeſty continued in that city, and not only ſat to him ſeveral times for his picture, but cauſed the prince of Wales, prince Rupert, and moſt of the lords of his court, to do ſo too. Mr Dobſon, however, being ſomewhat looſe and irregular in his way of life, was far from improving the many opportunities he had of making his fortune; and died very poor in 1647, at his houſe in St Martin's Lane.

DOBUNI, or Boduni; an ancient people of Britain, who poſſeſſed the territory which now forms the counties of Oxford and Glouceſter. Both the names of this Britiſh nation ſeem to have been derived from the low ſituation of a great part of the country which they inhabited: for both *Duvn* and *Bodun* ſignify "profound" or "low", in the ancient language of Gaul and Britain. The Dobuni are not mentioned among the Britiſh nations who reſiſted the Romans under Julius Cæſar, which was probably owing to the diſtance of their country from the ſcene of action; and before the next invaſion under Claudius, they had been ſo much oppreſſed by their ambitious neighbours the Cattivellauni, that they ſubmitted with pleaſure to the Romans, in order to be delivered from that oppreſſion. Cogidunus, who was at that time (as his name imports) prince of the Dobuni, recommended himſelf ſo effectually to the favour of the emperor Claudius, by his ready ſubmiſſion, and other means, that he was not only continued in the government of his own territories, but had ſome other ſtates put under his authority. This prince lived ſo long, and remained ſo ſteady a friend and ally to the Romans, that his ſubjects, being habituated to their obedience in his time, never revolted, nor ſtood in need of many forts or forces to keep them in ſubjection. This is certainly the reaſon that we meet with ſo few Roman towns and ſtations in the country anciently inhabited by the Dobuni. The Durocornovium of Antoninus, and the Corinium of Ptolemy, are believed by antiquaries to have been the ſame place, the capital of the Dobuni, and ſituated at Cirenceſter, in Glouceſterſhire, where there are many marks of a Roman ſtation. Clevum or Glevum, in the thirteenth iter of Antoninus, ſtood where the city of Glouceſter now ſtands; and Abone, in the fourteenth iter, was probably ſituated at Avinton on the Severn. The country of the Dobuni was comprehended in the Roman province Britannia Prima.

DOCETÆ (from δοκειν *to appear*), in eccleſiaſtical hiſtory, the followers of Julius Caſſianus, one of the Valentinian ſect, towards the cloſe of the ſecond century, who revived a notion that had been adopted by a branch of the Gnoſtics, againſt whom St John, Ignatius, and Polycarp, had aſſerted the truth of the incarnation. They believed and taught, as their name imports, that the actions and ſufferings of Jeſus Chriſt were not in reality, but only in appearance.

DOCIMASIA, in Greek antiquity, a probation of the magiſtrates and perſons employed in public buſineſs at Athens. It was performed publicly in the forum, where they were obliged to give account of themſelves and their paſt life before certain judges. Among ſeveral queſtions propoſed to them, we find the following: Whether they had been dutiful to their parents,

rents, had ſerved in the wars, and had a competent eſtate?

**DOCIMASTIC** ART, a name given to the art of eſſaying by operations in ſmall, the nature and quantity of metallic or other matters which may be obtained from mineral or other compound bodies. See REFINING and METALLURGY.

**DOCIMENUM** MARMOR, a name given by the ancients to a ſpecies of marble of a bright and clear white, much uſed in large and ſumptuous buildings, ſuch as temples and the like. It had its name from *Docimenos*, a city of Phrygia, afterwards called *Synaia;* near which it was dug, and from whence it was ſent to Rome. It was accounted little inferior to the Parian in colour, but not capable of ſo elegant a poliſh; whence it was leſs uſed by the ſtatuaries, or in other ſmaller works. The emperor Adrian is ſaid to have uſed this marble in building the temple of Jupiter; and many others of the great works of the Romans are of it.

**DOCK**, in botany. See RUMEX.

DOCK, in the manege, is uſed for a large caſe of leather, as long as the dock of a horſe's tail, which ſerves it for a cover. The French call the dock *trouſſequeue*. It is made faſt by ſtraps to the crupper, and has leathern thongs that paſs between his thighs, and along his flanks to the ſaddle-ſtraps, in order to keep the tail tight, and to hinder it from whiſking about.

DOCK, in maritime affairs, a ſort of broad and deep trench, formed on the ſide of a harbour, or on the banks of a river; and commodiouſly fitted either to build ſhips or receive them to be repaired and *breamed* therein. Theſe ſorts of docks have generally ſtrong flood-gates to prevent the flux of the tide from entering the dock while the ſhip is under repair.—There are likewiſe docks of another kind, called *wet docks*, where a ſhip can only be cleaned during the receſs of the tide, or in the interval between the time when the tide left her dry a-ground and the period when it again reaches her by the return of the flood. Docks of the latter kind are not furniſhed with the uſual flood-gates.

*DOCK-Yards*, certain magazines containing all ſorts of naval ſtores and timber for ſhip-building. In England, the royal dock-yards are at Chatham, Portſmouth, Plymouth, Deptford, Woolwich, and Sheerneſs. His majeſty's ſhips and veſſels of war are generally moored at theſe ports during the time of peace; and ſuch as want repairing are taken into the docks, examined, and refitted for ſervice.

The principal dock-yards are governed by a commiſſioner, reſident at the port; who ſuperintends all the muſters of the officers, artificers, and labourers, employed in the dock-yard and ordinary. He alſo controls their payment therein; examines the accounts; contracts, and draws bills on the navy-office to ſupply the deficiency of ſtores; and, finally, regulates whatever belongs to the dock-yard, maintaining due order in the reſpective offices.

Theſe yards are generally ſupplied from the northern crowns with hemp, pitch, tar, roſin, canvas, oak-plank, and ſeveral other ſpecies. With regard to the maſts, particularly thoſe of the largeſt ſize, they are uſually imported from New-England.

**DOCTOR**, a perſon who has paſſed all the degrees of a faculty, and is impowered to teach or practiſe the ſame: thus we ſay, doctor in divinity, doctor in phyſic, doctor of laws.

The eſtabliſhment of the *doctorate*, ſuch as now in uſe among us, is ordinarily attributed to Irnerius, who himſelf drew up the formulary. The firſt ceremony of this kind was performed at Bologna, in the perſon of Bulgarus, who began to profeſs the Roman law, and on that occaſion was ſolemnly promoted to the *doctorate*, *i. e.* inſtalled *juris utriuſque doctor*. But the cuſtom was ſoon transferred from the faculty of law to that of theology; the firſt inſtance whereof was given in the univerſity of Paris, where Peter Lombard and Gilbert de la Portree, the two chief divines of thoſe days, were created doctors in theology, *ſacræ theologiæ doctores*.

Spelman takes the title of doctor not to have commenced till after the publication of Lombard's ſentences, about the year 1140; and affirms, that ſuch as explained that work to their ſcholars were the firſt that had the appellation of doctors. Others go much higher, and hold Bede to have been the firſt doctor at Cambridge, and John de Beverley at Oxford, which latter died in the year 721. But Spelman will not allow doctor to have been the name of any title or degree in England till the reign of king John, about the year 1207.

To paſs doctor in divinity at Oxford, it is neceſſary the candidate have been four years bachelor of divinity. For doctor of laws, he muſt have been ſeven years in the univerſity to commence bachelor of law; five years after which he may be admitted doctor of laws. Otherwiſe, in three years after taking the degree of maſter of arts, he may take the degree of bachelor in law; and in four years more, that of LL. D. which ſame method and time are likewiſe required to paſs the degree of doctor in phyſic.

At Cambridge, to take the degree of doctor in divinity, it is required the candidate have been ſeven years bachelor of divinity. Though in ſeveral of the colleges the taking of the bachelor of divinity's degree is diſpenſed with, and they may go out *per ſaltum*. To commence doctor in laws, the candidate muſt have been five years bachelor of law, or ſeven years maſter of arts. To paſs doctor in phyſic, he muſt have been bachelor in phyſic five years, or ſeven years maſter of arts. A doctor of the civil law may exerciſe eccleſiaſtical juriſdiction, though a layman, ſtat. 37 Hen. VIII. cap. 17. ſect. 4.

*DOCTOR of the Law*, a title of honour among the Jews. The inveſtiture, if we may ſo ſay, of this order was performed by putting a key and table-book in their hands; which is what ſome authors imagine our Saviour had in view, Luke xi. 52. when, ſpeaking of the doctors of the law, he ſays, "Wo unto you doctors of the law, for you have taken away the key of knowledge: you entered not in yourſelves, and them that were entering you hindered."

*DOCTOR of the Church*, a title given to certain of the fathers whoſe doctrines and opinions have been the moſt generally followed and authoriſed. We uſually reckon four doctors of the Greek church, and three of the Latin. The firſt are St Athanaſius, St Baſil, St Gregory Nazianzen, and St Chryſoſtom. The latter are

St Jerom, St Auguſtine, and Gregory the Great. In the Roman breviary there is a particular office for the doctors. It only differs from that of the confeſſors, by the anthem of the Magnificat, and the leſſons.

Doctor, is alſo an appellation adjoined to ſeveral ſpecific epithets, expreſſing the merit of ſome of the ſchoolmen: thus, Alexander Hales is called the irrefragable doctor; Thomas Aquinas, the angelic doctor; St Bonaventure, the ſeraphic doctor; John Duns Scotus, the ſubtile doctor; Raimond Lully, the illuminated doctor; Roger Bacon, the admirable doctor, &c.

Doctor, Διδασκαλος, in the Greek church, is a particular officer, appointed to interpret part of the ſcriptures. He who interprets the Goſpels, is called *doctor of the Goſpels;* he who interprets St Paul's Epiſtles, *doctor of the Apoſtle:* he who interprets the Pſalms, *doctor of the Pſalter.*

*Doctors-Commons.* See *College of Civilians.*

DOCUMENT, in law, ſome written monument produced in proof of any thing aſſerted.

DODARTIA, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ.* The calyx is quinquedentated; the under lip of the corolla twice as long as the upper; the capſule bilocular and globoſe.

DODD (Dr William), an unfortunate Engliſh divine, eldeſt ſon of the Rev. William Dodd, many years vicar of Bourne in Lincolnſhire, was born May 29. 1729. He was ſent, at the age of 16, to the univerſity of Cambridge; and admitted, in the year 1745, a ſizar of Clare-Hall. In 1749-50 he took the degree of B. A. with great honour, being upon that occaſion in the liſt of wranglers. Leaving the univerſity, he imprudently married a Miſs Mary Perkins in 1751, was ordained a deacon the ſame year, prieſt in 1753, and ſoon became a celebrated and popular preacher. His firſt preferment was the lectureſhip of Weſt Ham. In 1754 he was alſo choſen lecturer of St Olave's, Hart-Street; and in 1757 took the degree of M. A. at Cambridge. On the foundation of the Magdalen Hoſpital in 1758, he was a ſtrenuous ſupporter of that charity, and ſoon after became preacher at the chapel of it. By the patronage of Biſhop Squire, he in 1763 obtained a prebend of Brecon, and by the intereſt of ſome city-friends procured himſelf to be appointed one of the king's chaplains; ſoon after which, he had the education of the preſent earl of Cheſterfield committed to his care. In 1766 he went to Cambridge and took the degree of LL. D. At this period, the eſtimation in which he was held by the world was ſufficient to give him expectations of preferment, and hopes of riches and honours; and theſe he might probably have acquired, had he poſſeſſed a common portion of prudence and diſcretion. But, impatient of his ſituation, and eager for advancement, he raſhly fell upon means which in the end were the occaſion of his ruin. On the living of St George, Hanover-Square, becoming vacant, he wrote an anonymous letter to the chancellor's lady, offering 3000 guineas if by her aſſiſtance he was promoted to it. This being traced to him, complaint was immediately made to the king, and Dr Dodd was diſmiſſed with diſgrace from his office of chaplain. From this period he lived neglected, if not deſpiſed; and his extravagance ſtill continuing, he became involved in difficulties, which tempted him to forge a bond from his late pupil lord Cheſterfield, Feb. 4. 1777, for L.4200, which he actually received: but being detected, he was tried at the Old Bailey, found guilty, and received ſentence of death; and, in ſpite of every application for mercy, was executed at Tyburn, June 27. 1777. Dr Dodd was a voluminous writer, and poſſeſſed conſiderable abilities, with little judgment and much vanity. An accurate liſt of his various writings is prefixed to his "Thoughts in Priſon," ed. 1781.

*Nichol's Anecdot. Boyer.*

DODDER, in botany. See Cuscuta.

DODDRIDGE (Philip), D. D. an eminent Preſbyterian miniſter, was the ſon of Daniel Doddridge an oil-man in London, where he was born on the 26th of June 1702; and having completed the ſtudy of the claſſics in ſeveral ſchools, was, in 1719, placed under the tuition of the reverend Mr John Jennings, who kept an academy at Kilworth in Leiceſterſhire. He was firſt ſettled as a miniſter at Kilworth, where he preached to a ſmall congregation in an obſcure village: but, on Mr Jennings's death, ſucceeded to the care of his academy; and ſoon after was choſen miniſter of a large congregation of Diſſenters at Northampton, to which he removed his academy, and where the number of his pupils increaſed. He inſtructed his pupils with the freedom and tenderneſs of a father; and never expected nor deſired that they ſhould blindly follow his ſentiments, but encouraged them to judge for themſelves. He checked any appearance of bigotry and uncharitableneſs, and endeavoured to cure them by ſhowing what might be ſaid in defence of thoſe principles they diſliked. He died at Liſbon, whither he went for the recovery of his health; and his remains were interred in the burying-ground belonging to the Britiſh factory there, and a handſome monument was erected to his memory in the meeting-houſe at Northampton, at the expence of the congregation, on which is an epitaph written by Gilbert Weſt, Eſq. He wrote, 1. Free Thoughts on the moſt probable means of reviving the Diſſenting Intereſt. 2. The Life of Colonel James Gardiner. 3. Sermons on the Education of Children. 4. The Riſe and Progreſs of Religion in the Soul. 5. The Family Expoſitor, in 6 vols 4to, &c. And ſince the author's death, a volume of his Hymns have been publiſhed, and his Theological Lectures. Several of his works have been tranſlated into Dutch, German, and French.

DODECAGON, in geometry, a regular polygon conſiſting of twelve equal ſides and angles.

DODECAHEDRON, in geometry, one of the platonic bodies, or regular ſolids, contained under twelve equal and regular pentagons.

DODECANDRIA (from δωδεκα *twelve*, and ανηρ *a man*); the name of the eleventh claſs in Linnæus's ſexual ſyſtem, conſiſting of plants with hermaphrodite flowers, that, according to the title, have twelve ſtamina or male organs. This claſs, however, is not limited with reſpect to the number of ſtamina. Many genera have ſixteen, eighteen, and even nineteen ſtamina; the eſſential character ſeems to be, that, in the claſs in queſtion, the ſtamina, however numerous, are inſerted into the receptacle: whereas in the next claſs, icoſandria, which is as little determined in point of number as the preſent, they are attached to the inſide of the calyx or flower-cup.

The orders in this claſs, which are ſix, are founded upon the number of the ſtyles, or female organs. Aſarabacca, mangoſtan, ſtorax, purple looſe-ſtrife, wild Syrian rue, and purſlane, have only one ſtyle; agrimony and heliocarpus have two; burning thorny plant, and baſtard rocket, three; *glinus*, five; *illicium*, eight; and houſe-leek, twelve.

DODECAS, in botany: A genus of the trigynia order, belonging to the dodecandria claſs of plants. The calyx is half quadrifid, having the corolla above; the corolla quinquefid; the capſule unilocular, conjoined with the calyx.

DODECATHEON, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 21ſt order, *Preciæ*. The corolla is verticillated and reflexed; the ſtamina placed in the tube; the capſule unilocular and oblong.

DODO, in ornithology. See Didus.

DODONA, a town of Theſprotia in Epirus, or (according to others) in Theſſaly. There was in its neighbourhood a celebrated oracle of Jupiter. The town and temple of the god were firſt built by Deucalion, after the univerſal deluge. It was ſuppoſed to be the moſt ancient oracle of all Greece; and according to the traditions of the Egyptians mentioned by Herodotus, it was founded by a dove. Two black doves, as he relates, took their flight from the city of Thebes in Egypt; one of which flew to the temple of Jupiter Ammon, and the other to Dodona, where with an human voice they acquainted the inhabitants of the country that Jupiter had conſecrated the ground, which in future would give oracles. The extenſive grove which ſurrounded Jupiter's temple was endowed with the gift of prophecy; and oracles were frequently delivered by the ſacred oaks and the doves which inhabited the place. This fabulous tradition of the oracular power of the doves is explained by Herodotus, who obſerves that ſome Phenicians carried away two prieſteſſes from Egypt, one of which went to fix her reſidence at Dodona, where the oracle was eſtabliſhed. It may farther be obſerved, that the fable might have been founded upon the double meaning of the word τελειαι, which ſignifies *doves* in moſt parts of Greece, while in the dialect of the Epirots it implies *old women*. In ancient times the oracles were delivered by the murmuring of a neighbouring fountain; but the cuſtom was afterwards changed. Large kettles were ſuſpended in the air near a brazen ſtatue, which held a laſh in its hand. When the wind blew ſtrong, the ſtatue was agitated and ſtruck againſt one of the kettles, which communicated the motion to all the reſt, and raiſed that clattering and diſcordant din, which continued for a while, and from which the artifice of the prieſts drew the predictions. Some ſuppoſe that the noiſe was occaſioned by the ſhaking of the leaves and boughs of an old oak, which the ſuperſtition of the people frequently conſulted, and from which they pretended to receive oracles. It may be obſerved with more probability, that the oracles were delivered by the prieſts, who, by artfully concealing themſelves behind the oaks, gave occaſion to the ſuperſtitious multitude to believe that the trees were endowed with the power of prophecy. As the ſhip Argo was built with ſome of the oaks of the foreſt of Dodona, there were ſome beams which gave oracles to the Argonauts, and warned them againſt the approach of calamity. Within the foreſt of Dodona there was a ſtream and a fountain of cool water which had the power of lighting a torch as ſoon as it touched it. This fountain was totally dry at noon day, and was reſtored to its full courſe at midnight, from which time till the following noon it began to decreaſe, and at the uſual hour was again deprived of its waters. The oracles of Dodona were generally delivered by women.

DODONÆA, in botany: A genus of the monogynia order belonging to the octandria claſs of plants. The calyx is tetraphyllous; there is no corolla; the capſule trilocular and inflated; the ſeeds twofold.

DODONIAN, *Dodonæus*, in antiquity, an epithet given to Jupiter, becauſe he was worſhipped in a temple built in the foreſt of Dodona, where was the moſt famous, and (it is ſaid) the moſt ancient, oracle of all Greece. See Dodona.

DODONIDES, the prieſteſſes who gave oracles in the temple of Jupiter in Dodona. According to ſome traditions the temple was originally inhabited by ſeven daughters of Atlas, who nurſed Bacchus. Their names were Ambroſia, Eudora, Paſithoe, Pytho, Plexaure, Coronis, Tythe or Tyche. In the later ages the oracles were always delivered by three old women; which cuſtom was firſt eſtabliſhed when Jupiter enjoyed the company of Dione, whom he permitted to receive divine honour in his temple at Dodona. The Bœotians were the only people of Greece who received their oracles at Dodona from men, for reaſons which Strabo, l. 9. fully explains.

DODRANS, in antiquity, three-fourths of the as. See the article As.

DODSLEY (Robert), a late eminent bookſeller, and ingenious writer, born at Mansfield in Nottinghamſhire, in the year 1703. He was not indebted to education for his literary fame, being originally a livery ſervant; but his natural genius, and early paſſion for reading, ſoon elevated him to a ſuperior ſtation. He wrote an elegant little ſatirical farce called *The Toy-ſhop*, which was acted with applauſe in 1735, and which recommended him to the patronage of Mr Pope. The following year he produced the *King and Miller of Mansfield*. The profits of theſe two farces enabled him to commence bookſeller, and his own merit procured him eminence in that profeſſion. He wrote ſome other dramatic pieces, and publiſhed a collection of his works in one vol. 8vo, under the modeſt title of *Trifles;* which was followed by *Public Virtue*, a poem in 4to. Beſide what he wrote himſelf, the public were obliged to him for exerting his judgment in the way of his buſineſs; he having collected ſeveral volumes of well choſen *Miſcellaneous Poems* and *Fugitive Pieces*, whoſe brevity would elſe have endangered their being totally loſt to poſterity. He died in 1764.

DODWELL (Henry), a very learned controverſial writer, born at Dublin, but of Engliſh extraction, in 1641. He wrote an incredible number of tracts: but his ſervices were ſo little acknowledged, that biſhop Burnet and others accuſe him of doing more hurt than good.

Doeſburg, Dog.

good to the cauſe of Chriſtianity, by his indiſcreet love of paradoxes and novelties, and thus expoſing himſelf to the ſcoffs of unbelievers. His pamphlet on the immortality of the ſoul gave riſe to the well known controverſy between Mr Collins and Dr Clark on that ſubject. He died in 1711.

DOESBURG, a town of the united provinces, in the county of Zutphen and province of Guelderland. It is ſmall, but well peopled, and very ſtrong both by art and nature, having the river Yſſel on one ſide, and a moraſs on the other, and is only to be approached by a narrow neck of land. E. Long. 5. 55. N. Lat. 52. 3.

DOG, in zoology: An animal remarkable for its natural docility, fidelity, and affection for its maſter; which qualities mankind are careful to improve for their own advantage. Theſe uſeful creatures guard our houſes, gardens, and cattle, with ſpirit and vigilance. By their help we are enabled to take not only beaſts, but birds; and to purſue game both over land and through the waters. In ſome northern countries, they ſerve to draw ſleds, and are alſo employed to carry burdens. In ſeveral parts of Africa, China, and by the Weſt Indian negroes, dogs are eaten, and accounted excellent food. Nay, we have the teſtimony of Mr Forſter, that dogs fleſh, in taſte, exactly reſembles mutton *. They were alſo uſed as food by the Romans, and long before them by the Greeks, as we learn from ſeveral treatiſes of Hippocrates. In the preſent times, their ſkins, dreſſed with the hair on, are uſed in muffs, made into a kind of buſkins for perſons in the gout, and for other purpoſes. Prepared in another way, they are uſed for ladies gloves, and the linings of maſks, being thought to make the ſkin peculiarly white and ſmooth. The French import many of theſe ſkins from Scotland, under a ſmall duty. Here, when tanned, they ſerve for upper leathers for neat pumps. Dogs ſkins dreſſed are exported under a ſmall, and imported under a high, duty. The French import from Denmark large quantities of dogs hair, both white and black. The laſt is eſteemed the beſt, and is worked up in the black liſt of a particular kind of woollen cloth; but is not uſed, as many have ſuppoſed, in making of hats, being entirely unfit for this purpoſe.

With regard to the qualities of dogs, thoſe bred in the iſland of Britain are juſtly reckoned ſuperior to the dogs bred in any other country. The ſwiftneſs of the gre-hound is amazing: as are alſo the ſteadineſs and perſeverance of other hounds and beagles; the boldneſs of terriers in unearthing foxes, &c.; the ſagacity of pointers and ſetting dogs, who are taught a language by ſigns as intelligible to ſportſmen as ſpeech; and the invincible ſpirit of a bull-dog, which can be quelled only by death.—All the nations in Europe not only do juſtice to the ſuperior qualities of the Britiſh dogs, but adopt our terms and names, and thankfully receive the creatures as preſents.—It is remarkable, however, that almoſt every kind of Britiſh dogs degenerates in foreign countries; nor is it poſſible to prevent this degeneracy by any art whatever.

For the natural hiſtory of the dog, ſee Canis.

*Chooſing of Dogs.* In order to chooſe a dog and bitch for good whelps, take care that the bitch come of a generous kind, be well proportioned, having large ribs and flanks; and likewiſe that the dog be of a good breed and young, for a young dog and an old bitch breed excellent whelps.

Dog. Sportſman's Dict.

The beſt time for hounds nitches, or bratchets, to be lined in, are the months of January, February, and March. The bitch ſhould be uſed to a kennel, that ſhe may like it after her whelping, and ſhe ought to be kept warm. Let the whelps be weaned after two months old; and though it be ſome difficulty to chooſe a whelp under the dam that will prove the beſt of the litter, yet ſome approve that which is laſt, and account him to be the beſt. Others remove the whelps from the kennel, and lay them ſeverally and apart one from the other; then they watch which of them the bitch firſt takes and carries into her kennel again, and that they ſuppoſe to be the beſt. Others again imagine that which weighs leaſt when it ſucks to be the beſt: this is certain, that the lighter whelp will prove the ſwifter. As ſoon as the bitch has littered, it is proper to chooſe them you intend to preſerve, and drown the reſt: keep the black, brown, or of one colour; for the ſpotted are not much to be eſteemed, though of hounds the ſpotted are to be valued.

Hounds for chaſe are to be choſen by their colours. The white, with black ears, and a black ſpot at the ſetting on of the tail, are the moſt principal to compoſe a kennel of, and of good ſcent and condition. The black hound, or the black tanned, or the all liver-coloured, or all white: the true talbots are the beſt for the ſtronger line; the grizzled, whether mixed or unmixed, ſo they be ſhag-haired, are the beſt verminers, and a couple of theſe are proper for a kennel.—In ſhort, take theſe marks of a good hound: That his head be of a middle proportion, rather long than round; his noſtrils wide, his ears large, his back bowed; his fillet great, his haunches large, thighs well truſſed, ham ſtrait, tail big near the reins, the reſt ſlender; the leg big, the ſole of the foot dry, and in the form of that of a fox, with large claws.

*Keeping Dogs in Health.*—As pointers and ſpaniels, when good of their kinds and well broken, are very valuable to a ſportſman, it is worth while to take ſome care to preſerve them in health. This very much depends on their diet and lodging: frequent cleaning their kennels, and giving them freſh ſtraw to lie on, is very neceſſary; or, in ſummer-time, deal-ſhavings, or ſand, inſtead of ſtraw, will check the breeding of fleas. If you rub your dog with chalk, and bruſh and comb him once or twice a week, he will thrive much the better; the chalk will clear his ſkin from all greaſineſs, and he will be the leſs liable to be mangy. A dog is of a very hot nature: he ſhould therefore never be without clean water by him, that he may drink when he is thirſty. In regard to their food, carrion is by no means proper for them: it muſt hurt their ſenſe of ſmelling, on which the excellence of theſe dogs greatly depends. Barley meal, the droſs of wheat flour, or both mixed together, with broth or ſkimmed milk, is very proper food. For change, a ſmall quantity of greaves from which the tallow is preſſed by the chandlers, mixed with flour, or ſheep's feet well baked or boiled, are a very good diet; and when you indulge them with fleſh, it ſhould always be boiled. In the ſeaſon of hunting your dogs, it is proper to feed them in the evening before, and give them nothing in the morning you intend to take them

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* See *America*, n° 90.

out except a little milk. If you ſtop for your own refreſhment in the day, you ſhould alſo refreſh your dogs with a little bread and milk. It has been already obſerved that dogs are of a hot conſtitution; the greateſt relief to them in the ſummer is twitch-graſs, or dog-graſs, which is the ſame thing. You ſhould therefore plant ſome of it in a place where you can turn them into every morning: they will feed freely on it to be cured of the ſickneſs they are ſubject to, and cured of any extraordinary heat of blood: but unleſs the graſs be of this ſort, it will have no effect.

*Diſeaſes of Dogs.*—1. *Bites and Stings.* If dogs are bitten by any venomous creatures, as ſnakes, adders, &c. ſqueeze out the blood, and waſh the place with ſalt and urine; then lay a plaſter to it made of calamint, pounded in a mortar, with turpentine and yellow wax, till it come to a ſalve. If you give your dog ſome of the juice of calamint to drink in milk, it will be good; or an ounce of treacle diſſolved in ſome ſweet wine.

2. *Mange.* Dogs are ſubject to the mange from being fed too high, and allowed no exerciſe or an opportunity of refreſhing themſelves with dog-graſs; or by being ſtarved at home, which will cauſe them to eat the vileſt ſtuff abroad, ſuch as carrion, or even human excrement; or by want of water, and ſometimes by not being kept clean in their kennel, or by foundering and melting in their greaſe. Either of theſe will heat the blood to a great degree, which will have a tendency to make them mangy. The cure may be effected by giving ſtone-brimſtone powdered fine, either in milk or mixed up with butter, and rubbing them well every day for a week with an ointment made of ſome of the brimſtone and pork-lard, to which add a ſmall quanity of oil of turpentine.—Or, boil four ounces of quickſilver in two quarts of water to half the quantity; bathe them every day with this water, and let them have ſome of it to lick till the cure is perfected. Or, a ſmall quantity of trooper's ointment rubbed on the parts on its firſt appearance will cure it. It will alſo free louſy puppies from their lice. Or, take two ounces of euphorbium; flour of ſulphur, Flanders oil of bays, and ſoft ſoap, each four ounces. Anoint and rub your dog with it every other day; give him warm milk, and no water. The cure will be performed in about a week. The following receipt is alſo ſaid to be efficacious. Take two handfuls of wild creſſes, and as much elecampane, and alſo of the leaves and roots of roerb and ſorrel, and two pounds of the roots of fodrels: boil all theſe well together in lee and vinegar; ſtrain the decoction, and put into it two pounds of grey ſoap, and when it is melted, rub the dog with it four or five days ſucceſſively, and it will cure him.

3. *Poiſon.* If you ſuſpect your dog to be poiſoned with nux vomica (the poiſon uſually employed by the warreners, which cauſes convulſive fits and ſoon kills), the moſt effectual remedy, if immediately applied, is to give him a good deal of common ſalt; to adminiſter which, you may open his mouth, and put a ſtick acroſs to prevent the ſhutting it, whilſt you cram his throat full of ſalt, at the ſame time holding his mouth upwards; and it will diſſolve ſo that a ſufficient quantity will be ſwallowed to purge and vomit him. When his ſtomach is ſufficiently cleared by a free paſſage obtained by ſtool, give him ſome warm broth frequently, to prevent his expiring from faintneſs; and he will recover.

Dog.
Sportſman's Dict.

4. *Worms.* Dogs are very frequently troubled with worms; but more particularly whilſt they are young. Any thing bitter is ſo nauſeous to theſe worms, that they are very often voided by taking two or three purges of aloes; or (which is the ſame thing) Scots pills, four or five being a doſe for a large dog: this is to be repeated two or three times in a week. If this do not ſucceed, you may give him an ounce of powder of tin mixed up with butter, in three doſes; which ſeldom fails to cure. Or of the herb ſavin, dried and rubbed to powder, give about as much as will lie on a ſhilling for a doſe; which will entirely deſtroy worms and their ſeed.

6. *Sore Feet.* A pointer ought not to be hunted oftener than two or three days in a week; and unleſs you take care of his feet, and give him good lodging as well as proper food, he will not be able to perform that through the ſeaſon. You ſhould therefore, after a hard day's hunting, waſh his feet with warm water and ſalt; and when dry, waſh them with warm broth, or beer and butter, which will heal their ſoreneſs, and prevent a ſettled ſtiffneſs from fixing.

7. *Strains, Blows, or ſmall Wounds.* If your dog has received any little wounds by forcing through hedges, or gets any lameneſs from a blow or ſtrain; bathe the wound or grieved part with ſalt and cold vinegar (for warming it only evaporates the fine ſpirit); and when dry, if a wound, you may pour in it a little friar's balſam, which will perform the cure ſooner than any method hitherto experienced.

8. *Coughs and Colds.* Dogs are very ſubject to a cough, with an extraordinary choaking, which is thought to ariſe generally from a cold or ſome inward diſorder; and probably it is often occaſioned by their eating of fiſh-bones. To guard againſt it, order your ſervants to throw all ſuch fiſh-bones where the dog can't get at them. But if the diſorder be from a cold, let bleeding be repeated in ſmall quantities, if neceſſary; but if it be what is called the *diſtemper* in dogs, and they appear to be very low in ſpirits, the bleeding is better omitted. Let meat-broth, or milk-broth warmed, be the principal part of his diet, uſing at the ſame time the following medicine. Take flour of ſulphur, cold drawn linſeed oil, and ſalt-petre, of each an ounce; divide it into four doſes, giving him one doſe every other day, and let him have plenty of clean ſtraw to lie on; or one ſpoonful of honey daily.

*Dog-Madneſs.* Of this there are no leſs than ſeven ſorts common among dogs. The chief cauſes are, high-feeding, want of exerciſe, fulneſs of blood, and coſtiveneſs. As for the two firſt, you muſt obſerve when you hunt them, that they ſhould be better fed than when they reſt; and let them be neither too fat nor too lean; but, of the two, rather fat than lean; by which means they will not only be preſerved from madneſs but alſo from the mange and ſcab: which diſeaſes they will be ſubject to for want of air, water, or exerciſe; but if you have but the knowledge to keep them in an even temper, they may live long, and continue ſound. As for water, they ſhould be left to their own pleaſure; but for exerciſe and diet, it muſt be ordered according to diſcretion, obſerving a medium.

Dog.

Sportſman's Dict.

um. Give them once a week, eſpecially in the heat of the year, five or ſix ſpoonfuls of ſalad oil, which will cleanſe them: at other times, the quantity of a hazelnut of mithridate is an excellent thing to prevent diſeaſes. It is alſo very good to bleed them under the tongue, and behind the ears.

The ſymptoms of madneſs are many and eaſily diſcerned. When any dog ſeparates himſelf contrary to his former uſe, becomes melancholy or droops his head, forbears eating, and as he runs ſnatches at every thing; if he often looks upwards, and his ſtern at his ſetting on be a little erect, and the reſt hanging down; if his eyes be red, his breath ſtrong, his voice hoarſe, and he drivels and foams at the mouth; you may be aſſured he has this diſtemper.

The ſeven ſorts of madneſs are as follow; of which the two firſt are incurable. 1. The hot burning madneſs. 2. The running madneſs. The animals labouring under theſe are peculiarly dangerous; for all things they bite and draw blood from will have the ſame diſtemper; and they generally ſeize on all they meet with, but chiefly on dogs: their pain is ſo great it ſoon kills them.—The five curable madneſſes are,

3. *Sleeping madneſs*, ſo called from the dog's great drowſineſs, and almoſt continual ſleeping. This is cauſed by the little worms that breed in the mouth of the ſtomach, from corrupt humours, vapours, and fumes which aſcend to the head: for cure of which, take ſix ounces of the juice of wormwood, two ounces of the powder of hartſhorn burnt, and two drams of agaric; mix all theſe together in a little white-wine, and give it the dog to drink in a drenching horn.

4. *Dumb madneſs*, lies alſo in the blood, and cauſes the dog not to feed, but to hold his mouth always wide open, frequently putting his feet to his mouth, as if he had a bone in his throat: to cure this, take the juice of black hellebore, the juice of *ſpatula putrida*, and of rue, of each four ounces; ſtrain them well, and put thereto two drams of unprepared ſcammony; and being mixed well together, put it down the dog's throat with a drenching horn, keeping his head up for ſome time, leſt he caſt it out again; then bleed him in the mouth, by cutting two or three veins in his gums.

It is ſaid, that about eight drams of the juice of an herb called *hartſhorn*, or *dog's tooth*, being given to the dog, cures all ſorts of madneſs.

5. *Lunk madneſs*, is ſo called by reaſon of the dog's leanneſs and pining away. For cure give them a purge as before directed, and alſo bleed them: but ſome ſay there is no cure for it.

6. *Rheumatic* or *ſlavering madneſs*, occaſions the dog's head to ſwell, his eyes to look yellow, and he will be always ſlavering and driveling at the mouth. To cure which, take four ounces of the powder of the roots of polipody of the oak, ſix ounces of the juice of fennel-roots, with the like quantity of the roots of miſletoe, and four ounces of the juice of ivy: boil all theſe together in white-wine, and give it to the dog as hot as he can take it, in a drenching horn.

7. *Falling madneſs*, is ſo termed becauſe it lies in the dog's head, and makes him reel as he goes, and to fall down. For the cure, take four ounces of the juice of briony, and the ſame quantity of the juice of peony, with four drams of ſtaveſacre pulverized; mix theſe together, and give it the dog in a drenching horn; alſo let him blood in the ears, and in the two veins that come down his ſhoulders; and indeed bleeding is neceſſary for all ſorts of madneſs in dogs.

When a dog happens to be bit by a mad one, there is nothing better than their licking the place with their own tongues, if they can reach it; if not, then let it be waſhed with butter and vinegar, made luke-warm, and let it afterwards be anointed with Venice turpentine; but, above all, take the juice of the ſtalks of ſtrong tobacco boiled in water, and bathe the place therewith; alſo waſh him in ſea-water, or water artificially made ſalt: give him likewiſe a little mithridate inwardly in two or three ſpoonfuls of ſack; and ſo keep him apart; and if you find him after ſome time ſtill to droop, the beſt way is to hang him.

Some have aſſerted their having cured ſeveral creatures that have been bit by mad dogs, with only giving them the middle yellow bark of buckthorn; which muſt be boiled in ale for a horſe or cow, and in milk for a dog; but that it muſt be boiled till it is as bitter as you can take it.

As to the preventive of worming dogs, ſee WORMING.

*Dog-Days*. See CANICULA.

*Dog-Fiſh*, in ichthyology. See SQUALUS.

*Dogs-Bane*. See APOCYNUM.

*Dog-Wood Tree*. See PISCIDIA.

DOGE, the chief magiſtrate in the republics of Venice and Genoa.

The word properly ſignifies *duke*, being formed from the Latin *dux*; as *dogate*, and *dogado*, from *ducatus*, "duchy."

The dogate, or office and dignity of doge, is elective; at Venice, the doge is elected for life; at Genoa, only for two years; he is addreſſed under the title of *Serenity*, which among the Venetians is ſuperior to that of highneſs.

The doge is the chief of the council, and the mouth of the republic; yet the Venetians do not go into mourning at his death, as not being their ſovereign, but only their firſt miniſter. In effect, the doge of Venice is no more than the phantom or ſhadow of the majeſty of a prince; all the authority being reſerved to the republic. He only lends his name to the ſenate; the power is diffuſed throughout the whole body, though the anſwers be all made in the name of the doge. If he gives any anſwers on his own account, they muſt be very cautiouſly expreſſed, and in general terms, otherwiſe he is ſure to meet with a reprimand. So that it is abſolutely neceſſary he be of an eaſy and pliable diſpoſition.

Anciently the doges were ſovereigns; but things are much altered; and at preſent, all the prerogatives reſerved to the quality of doge, are theſe which follow: he gives audience to ambaſſadors; but does not give them any anſwer from himſelf, in matters of any importance; only he is allowed to anſwer according to his own pleaſure, to the compliments they make to the ſignory; ſuch anſwers being of no conſequence. The doge, as being firſt magiſtrate, is head of all the councils; and the credentials which the ſenate furniſhes its miniſters in foreign courts, are written in his name; and yet he does not ſign them; but a ſecretary of ſtate ſigns them, and ſeals them with the arms of the republic. The ambaſſadors direct their diſpatches to the doge; and yet he may not open them but in preſence of the counſellors. The money is ſtruck in the doge's name, but not with his ſtamp or arms. All the magiſtrates riſe, and ſalute the doge when he comes into council; and the doge riſes to none but foreign ambaſſadors.

The doge nominates to all the benefices in the church of St Mark; he is protector of the monaſtery delle Virgine; and beſtows certain petty offices of uſhers of the houſehold, called *Commanders of the Palace*. His family is not under the juriſdiction of the maſter of the ceremonies; and his children may have ſtaff-officers, and gondoliers in livery.

His grandeur, at the ſame time, is tempered with a variety of circumſtances, which render it burdenſome. He may not go out of Venice without leave of the council; and if he does go out, he is liable to receive affronts, without being intitled to demand ſatisfaction; and, if any diſorder ſhould happen where he was, it belongs not to him, but to the podeſta, as being inveſted with the public authority, to compoſe it.

The children and brothers of the doge are excluded from all the chief offices of ſtate. They may not receive any benefice from the court of Rome; but are allowed to accept of the cardinalate, as being no benifice, nor including any juriſdiction. The doge may not diveſt himſelf of his dignity, for his eaſe; and after his death, his conduct is examined by three inquiſitors and five correctors, who ſift it with great ſeverity.

DOGGER, a Dutch fiſhing veſſel navigated in the German Ocean. It is generally employed in the herring fiſhery; being equipped with two maſts, *viz.* a main-maſt and a mizen-maſt, and ſomewhat reſembling a ketch. See the Plates at the article Ship.

DOGGERS, in the Engliſh alum works, a name given by the workmen to a ſort of ſtone found in the ſame mines with the true alum rock, and containing ſome alum, though not near ſo much as the right kind. The county of York, which abounds greatly with the true alum rock, affords alſo a very conſiderable quantity of theſe doggers; and in ſome places they approach ſo much to the nature of the true rock, that they are wrought to advantage.

DOGMA, a principle, maxim, tenet, or ſettled opinion, particularly with regard to matters of faith and philoſophy.

DOGMATICAL, ſomething belonging to a doctrine or opinion. A dogmatical philoſopher is one who aſſerts things poſitively; in oppoſition to a ſceptic, who doubts of every thing.

DOGMATISTS, a ſect of ancient phyſicians, of which Hippocrates was the firſt author. They are alſo called *logici*, "logicians," from their uſing the rules of logic in ſubjects of their profeſſion. They laid down definitions and diviſions; reducing diſeaſes to certain genera, and thoſe genera to ſpecies, and furniſhing remedies for them all; ſuppoſing principles, drawing concluſions, and applying thoſe principles and concluſions to particular diſeaſes under conſideration: in which ſenſe, the dogmatiſts ſtand contradiſtinguiſhed from empirics and methodiſts. They reject all medicinal virtues that they think not reducible to manifeſt qualities: but Galen hath long ago obſerved of ſuch men, that they muſt either deny plain matter of fact, or aſſign but very poor reaſons and cauſes of many effects they pretend to explain.

DOLCE (Carlo, or Carlino), a celebrated hiſtory and portrait painter, was born at Florence in 1616, and was the diſciple of Vignali. This great maſter was particularly fond of repreſenting pious ſubjects, though he ſometimes painted portraits; and his works are eaſily diſtinguiſhed by the peculiar delicacy with which he perfected all his compoſitions, by a pleaſing tint of colour, and by a judicious management of the chiaro ſcuro. His performance was remarkably ſlow; and it is reported that his brain was fatally affected by ſeeing Luca Jordana diſpatch more buſineſs in four or five hours than he could have done in as many months. He died in 1686.

DOLE, in the Saxon and Britiſh tongue, ſignified a a part or portion, moſt commonly of a meadow, where ſeveral perſons have ſhares. It alſo ſtill ſignifies a diſtribution or dealing of alms, or a liberal gift made by a great man to the people.

Dole, in Scots law, ſignifies a malevolent intention. It is eſſential in every crime, that it be committed intentionally, or by an act of the will: hence the rule, *Crimen dolo contrahitur.*

DOLICHOS, in botany: A genus of the decandria order, belonging to the diadelphia claſs of plants; and in the natural method ranking under the 32d order, *Papilionaceæ.* The baſis of the vexillum has two callous knobs, oblong, parallel, and compreſſing the alæ below. There are 25 ſpecies; the moſt remarkable of which are the following.

1. The lablab, with a winding ſtalk, is a native of warm climates, where it is frequently cultivated for the table. Mr Haſſelquiſt informs us, that it is cultivated in the Egyptian gardens, but is not a native of that country. The Egyptians make pleaſant arbours with it in their houſes and gardens, by ſupporting the ſtem and leading it where they think proper. They not only ſupport it with ſticks and wood, but tie it with cords; by which means the leaves form an excellent covering, and an agreeable ſhade.

2. The ſoja is a native of Japan, where it is termed *daidſu;* and, from its excellence, *mame;* that is, "the legumen or pod," by way of eminence. It grows with an erect, ſlender, and hairy ſtalk, to the height of about four feet. The leaves are like thoſe of the garden kidney-bean*. The flowers are of a bluiſh white, and produced from the boſom of the leaves, and ſucceeded by briſtly hanging pods reſembling thoſe of the yellow lupine, which commonly contain two, ſometimes three, large white ſeeds. There is a variety of this kind, with a ſmall black fruit, which is uſed in medicine. Kempfer affirms, that the ſeeds of this when pounded and taken inwardly give relief in the aſthma. This legumen is doubly uſeful in the Japaneſe kitchens. It ſerves for the preparation of a ſubſtance named *miſo*, that is uſed as butter; and likewiſe a pickle celebrated among them under the name of *ſooju* or *ſoy*. To make the firſt, they take a meaſure of mame, or the beans produced by the plant: after boiling them for a conſiderable time in water, and to a proper degree of ſoftneſs, they

* See *Phaſeolus.*

they beat or bray them into a ſoftiſh pulſe; incorporating with it, by means of repeated braying, a large quantity of common ſalt, four meaſures in ſummer, in winter three. The leſs ſalt that is added, the ſubſtance is more palatable; but what it gains in point of taſte, it loſes in durability. They then add to this mixture a certain preparation of rice, to which they give the name of *koos;* and having formed the whole into a compoſt, remove it into a wooden veſſel which had lately contained their common ale or beverage named *ſacki*. In about two months it is fit for uſe. The koos gives it a grateful taſte; and the preparing of it, like the polenta of the Germans, requires the ſkilful hand of an experienced maſter. For this reaſon there are certain people who make it their ſole buſineſs to prepare the koos, and who ſell it ready made for the purpoſe of making miſo: a ſubſtance which cannot fail to be greatly valued in thoſe countries where butter from the milk of animals is unknown. To make ſooju or ſoy, they take equal quantities of the ſame beans boiled to a certain degree of ſoftneſs; of muggi, that is corn, whether barley or wheat, roughly ground; and of common ſalt. Having properly mixed the beans with the pounded corn, they cover up the mixture, and keep it for a day and a night in a warm place, in order to ferment; then putting the maſs into a pot, they cover it with the ſalt, pouring over the whole two meaſures and a half of water. This compound ſubſtance they carefully ſtir at leaſt once a-day, if twice or thrice the better, for two or three months: at the end of which time, they filtrate and expreſs the maſs, preſerving the liquor in wooden veſſels. The older it is, the better and the clearer; and if made of wheat inſtead of barley, greatly blacker. The firſt liquor being removed, they again pour water upon the remaining maſs; which, after ſtirring for ſome days, as before, they expreſs a ſecond time, and thus obtain an inferior ſort of ſoy.

3. The pruriens, or cow-itch, is alſo a native of warm climates. It hath a fibrous root, and an herbaceous climbing ſtalk, which is naked, dividing into a great number of branches; and riſes to a great height when properly ſupported. The leaves are alternate and trilobate, riſing from the ſtem and branches about 12 inches diſtant from each other. The footſtalk is cylindrical, from 6 to 14 inches long. From the axilla of the leaf deſcends a pendulous ſolitary ſpike, from 6 to 14 inches long, covered with long blood-coloured papilionaceous flowers, riſing by threes in a double alternate manner from ſmall fleſhy protuberances, each of which is a ſhort pedunculus of three flowers. Theſe are ſucceeded by leguminous, coriaceous pods, four or five inches long, crooked like an Italic *ſ;* denſely covered with ſharp hairs, which penetrate the ſkin, and cauſe great itching. This will grow in any ſoil in thoſe countries where it is a native: but is generally eradicated from all cultivated grounds; becauſe the hairs from the pods fly with the winds, and torment every animal they happen to touch. If it was not for this miſchievous quality, the beauty of its flowers would intitle it to a place in the beſt gardens. It flowers in the cool months, from September to March, according to the ſituation.—The ſpiculæ, or ſharp-hairs, of this plant, have been long uſed in South America in caſes of worms; and have of late been frequently employed in Britain. The ſpiculæ of one pod mixed with ſyrup or molaſſes, and taken in the morning faſting, is a doſe for an adult. The worms are ſaid to appear with the ſecond or third doſe; and by means of a purge in ſome caſes the ſtools are ſaid to have conſiſted almoſt entirely of worms; and in caſes of lumbrici, it is ſaid to produce a ſafe and effectual cure. Thoſe who have uſed it moſt, particularly Dr Bancroft and Dr Cochrane, affirm that they have never ſeen any inconvenience reſulting from the internal uſe of it, notwithſtanding the great uneaſineſs it occaſions on the ſlighteſt touch to any part of the ſurface.

DOLLAR, or Daller, a ſilver coin, nearly of the value of the Spaniſh piece of eight or French crown.

Dollars are coined in different parts of Germany and Holland; and have their diminutions, as ſemi-dollars, quarter dollars, &c. See *Money-Table.*

They are not all of the ſame fineneſs nor weight. The Dutch dollars are the moſt frequent. In the Levant they are called *aſlaini*, from the impreſſion of a lion thereon.

DOLPHIN, in ichthyology. See Delphinus.

*Dolphin of the Maſt*, a peculiar kind of wreath, formed of plaited cordage, to be faſtened occaſionally round the maſts, as a ſupport to the puddening, whoſe uſe is to ſuſtain the weight of the fore and main yards in caſe the rigging or chains by which thoſe yards are ſuſpended ſhould be ſhot away in the time of battle; a circumſtance which might render their ſails uſeleſs at a ſeaſon when their aſſiſtance is extremely neceſſary. See the article Puddening.

DOM, or Don, a title of honour, invented and chiefly uſed by the Spaniards, ſignifying *ſir* or *lord*.

This title, it ſeems, was firſt given to Pelayo, in the beginning of the eighth century. In Portugal no perſon can aſſume the title of *don* without the permiſſion of the king, ſince it is looked upon as a mark of honour and nobility. In France it is ſometimes uſed among the religious. It is an abridgment of *domnus*, from *dominus*.

*Dom and Som*, in old charters, ſignifies full property and juriſdiction.

DOMAIN, the inheritance, eſtate, or poſſeſſion of any one. See Demesne.

DOMAT (John), a celebrated French lawyer born in 1625, who obſerving the confuſed ſtate of the laws, digeſted them in 4 vols 4to, under the title of The Civil Laws in their natural order: for which undertaking, Louis XIV. ſettled on him a penſion of 2000 livres. Domat was intimate with the famous Paſcal, who left him his private papers at his death: he himſelf died in 1696.

DOME, in architecture, a ſpherical roof, or a roof of a ſpherical form, raiſed over the middle of a building, as a church, hall, pavilion, veſtibule, ſtair-caſe, &c. by way of crowning.

Dome, in chemiſtry, the upper part of furnaces, particularly portable ones. It has the figure of a hollow hemiſphere or ſmall dome. Its uſe is to form a ſpace in the upper part of the furnace, the air of which is continually expelled by the fire: hence the current of air is conſiderably increaſed, which is obliged to enter by the aſh-hole, and to paſs through the fire, to ſupply the place of the air driven from the dome. The form of this piece renders it proper to reflect or reverberate a part of the flame upon the matters which are in the furnace, which has occaſioned this kind of furnace to be called a *reverberating* one. See Furnace.

Dome, or *Doom*, ſignifies judgment, ſentence, or decree. The homagers oath in the black book of Hereford ends thus: "So help me God at his holy *dome*, and by my trowthe."

DOMENICHINO, a famous Italian painter, born of a good family at Bologna in 1581. He was at firſt a diſciple of Calvart the Fleming, but ſoon quitted his ſchool for that of the Caraccis. He always applied himſelf to his work with much ſtudy and thoughtfulneſs; and never offered to touch his pencil but when he found a proper kind of enthuſiaſm upon him. His great ſkill in architecture alſo procured him the appointment of chief architect of the apoſtolical palace from Pope Gregory XV.; nor was he without a theoretical knowledge in muſic. He died in 1641.

DOMESDAY, or doomsday, Book, a moſt ancient record, made in the time of William I. ſurnamed the *Conqueror*, and containing a ſurvey of all the lands of England. It conſiſts of two volumes, a greater and a leſs. The firſt is a large folio, written on 382 double pages of vellum, in a ſmall but plain character; each page having a double column. Some of the capital letters and principal paſſages are touched with red ink; and ſome have ſtrokes of red ink run croſs them, as if ſcratched out. This volume contains the deſcription of 31 counties. The other volume is in quarto, written upon 450 double pages of vellum, but in a ſingle column, and in a large but very fair character. It contains the counties of Eſſex, Norfolk, Suffolk, part of the county of Rutland included in that of Northampton, and part of Lancaſhire in the counties of York and Cheſter.

This work, according to the red book in the exchequer, was begun by order of William the Conqueror, with the advice of his parliament, in the year of our Lord 1080, and completed in the year 1086. The reaſon given for taking this ſurvey, as aſſigned by ſeveral ancient records and hiſtorians, was, that every man ſhould be ſatisfied with his own right, and not uſurp with impunity what belonged to another. But, beſides this, it is ſaid by others, that now all thoſe who poſſeſſed landed eſtates became vaſſals to the king, and paid him ſo much money by way of fee or homage in proportion to the lands they held. This appears very probable, as there was at that time extant a general ſurvey of the whole kingdom, made by order of king Alfred.

For the execution of the ſurvey recorded in domeſday book, commiſſioners were ſent into every county and ſhire; and juries ſummoned in each hundred, out of all orders of freemen, from barons down to the loweſt farmers. Theſe commiſſioners were to be informed by the inhabitants, upon oath, of the name of each manor, and that of its owner; alſo by whom it was held in the time of Edward the Confeſſor; the number of hides; the quantity of wood, of paſture, and of meadow-land; how many ploughs were in the demeſne, and how many in the tenanted part of it; how many mills, how many fiſh-ponds or fiſheries belonged to it; with the value of the whole together in the time of king Edward, as well as when granted by king William, and at the time of this ſurvey; alſo whether it was capable of improvement, or of being advanced in its value: they were likewiſe directed to return the tenants of every degree, the quantity of lands then and formerly held by each of them, what was the number of villains or ſlaves, and alſo the number and kinds of their cattle and live ſtock. Theſe inquiſitions being firſt methodized in the county, were afterwards ſent up to the king's exchequer.

This ſurvey, at the time it was made, gave great offence to the people; and occaſioned a jealouſy that it was intended for ſome new impoſition. But notwithſtanding all the precaution taken by the conqueror to have this ſurvey faithfully and impartially executed, it appears from indiſputable authority, that a falſe return was given in by ſome of the commiſſioners; and that, as it is ſaid, out of a pious motive. This was particularly the caſe with the abbey of Croyland in Lincolnſhire, the poſſeſſions of which were greatly underrated both with regard to quantity and value. Perhaps more of theſe pious frauds were diſcovered, as it is ſaid Ralph Flambard, miniſter to William Rufus, propoſed the making a freſh and more vigorous inquiſition; but this was never executed.

Notwithſtanding this proof of its falſehood in ſome inſtances, which muſt throw a ſuſpicion on all others, the authority of domeſday-book was never permitted to be called in queſtion; and always, when it hath been neceſſary to diſtinguiſh whether lands were held in ancient demeſne, or in any other manner, recourſe was had to domeſday-book, and to that only, to determine the doubt. From this definitive authority, from which, as from the ſentence pronounced at *domeſday*, or the day of judgment, there could be no appeal, the name of the book is ſaid to have been derived. But Stowe aſſigns another reaſon for this appellation; namely, that domeſday-book is a corruption of *domus Dei book*; a title given it becauſe heretofore depoſited in the king's treaſury, in a place of the church of Weſtminſter or Wincheſter, called *domus Dei*. From the great care formerly taken for the preſervation of this ſurvey, we may learn the eſtimation in which its importance was held. The dialogue de Scaccariis ſays, "*Liber ille* (domeſday) *ſigilli regis comes eſt individuus in theſauro*." Until lately it has been kept under three different locks and keys; one in the cuſtody of the treaſurer, and the others in that of the two chamberlains of the exchequer. It is now depoſited in the chapter-houſe at Weſtminſter, where it may be conſulted on paying to the proper officers a fee of 6s. 8d. for a ſearch, and fourpence per line for a tranſcript.

Beſides the two volumes above mentioned, there is alſo a third made by order of the ſame king; and which differs from the others in form more than matter. There is alſo a fourth called *domeſday*, which is kept in the exchequer; which, though a very large volume, is only an abridgement of the others. In the remembrancer's office in the exchequer is kept a fifth book, likewiſe called *domeſday*, which is the ſame with the fourth book already mentioned. King Alfred had a roll which he called *domeſday*; and the domeſday-book made by William the Conqueror referred to the time of Edward the Confeſſor, as that of king Alfred did to the time of Ethelred. The fourth book of domeſday having many pictures and gilt letters in the beginning relating to the time of king Edward the Confeſſor, this had led ſome into a falſe opinion that domeſday-book was compoſed in the reign of king Edward.

DOMESTIC, any man who acts under another, ſerving to compoſe his family; in which he lives, or is ſuppoſed to live, as a chaplain, ſecretary, &c. Sometimes domeſtic is applied to the wife and children; but very ſeldom to ſervants, ſuch as footmen, lacquies, porters, &c.

*Domestic, adj.* is ſometimes oppoſed to foreign. Thus "*domeſtic* occurrences" ſignify thoſe events which happen in our own country, in contradiſtinction to thoſe of which we receive intelligence from abroad.

In its more uſual acceptation, the term implies ſomething peculiar to *home* or *houſehold*. Thus we ſpeak of *domeſtic* happineſs or pleaſures: meaning the pleaſures enjoyed in the boſom of one's family; in oppoſition to thoſe found in the buſtle of public life, or deluſively ſought in the haunts of diſſipation.

The ſolace of domeſtic enjoyments has been coveted by the wiſeſt and greateſt of men. Senators and heroes have ſhut out the acclamations of an applauding world, to enjoy the prattling of their little ones, and to partake the endearments of family converſation. They knew that even their beſt friends, in the common intercourſe of life, were in ſome degree actuated by intereſted motives in diſplaying their affection; that many of their followers applauded them in hopes of reward; and that the giddy multitude, however zealous, were not always judicious in their approbation. But the attentions paid them at their fire-ſide, the ſmiles which exhilarated their own table, were the genuine reſult of undiſſembled love.

*Knox's Eſſays,* N° 40.

To purſue the obſervations of an elegant eſſayiſt: "The nurſery has often alleviated the fatigues of the bar and the ſenate-houſe. Nothing contributes more to raiſe the gently pleaſing emotions, than the view of infant innocence, enjoying the raptures of a game at play. All the ſentiments of uncontrouled nature diſplay themſelves to the view, and furniſh matter for agreeable reflection to the mind of the philoſophical obſerver. To partake with children in their little pleaſures, is by no means unmanly. It is one of the pureſt ſources of mirth. It has an influence in amending the heart, which neceſſarily takes a tincture from the company that ſurrounds us. Innocence as well as guilt is communicated and increaſed by the contagion of example. And the great Author of evangelical philoſophy has taught us to emulate the ſimplicity of the infantine age. He ſeems indeed himſelf to have been delighted with young children, and found in them, what he in vain ſought among thoſe who judged themſelves their ſuperiors, unpolluted purity of heart.

"Among the great variety of pictures which the vivid imagination of Homer has diſplayed throughout the Iliad, there is not one more pleaſing than the family-piece, which repreſents the parting interview between Hector and Andromache. It deeply intereſts the heart, while it delights the imagination. The hero ceaſes to be terrible, that he may become amiable. We admire him while he ſtands completely armed in the field of battle; but we love him more while he is taking off his helmet, that he may not frighten his little boy with its nodding plumes. We are refreſhed with the tender ſcene of domeſtic love, while all around breathes rage and diſcord. We are pleaſed to ſee the arm, which is ſhortly to deal death and deſtruction among a hoſt of foes, employed in careſſing an infant ſon with the embraces of paternal love. A profeſſed critic would attribute the pleaſing effect entirely to contraſt; but the heart has declared, previouſly to the inquiries of criticiſm, that it is chiefly derived from the ſatisfaction which we naturally take in beholding great characters engaged in tender and amiable employments.

"But after all that is ſaid of the purity and the ſolidity of domeſtic pleaſures, they unfortunately appear, to a great part of mankind, inſipid, unmanly, and capable of ſatisfying none but the weak, the ſpiritleſs, the inexperienced, and the effeminate. The pretenders to wit and modern philoſophy are often found to renounce the received opinions of prudential conduct; and, while they affect a ſuperior liberality, to regulate their lives by the moſt ſelfiſh principles. Whatever appears to have little tendency to promote perſonal pleaſure and advantage, they leave to be performed by thoſe ſimple individuals, who are dull enough, as they ſay, to purſue the journey of life by the ſtraight road of common ſenſe. It is true, they will allow, that the world muſt be repleniſhed by a perpetual ſucceſſion; and it is no leſs true, that an offspring, once introduced into the world, requires all the care of painful attention. But let the taſk be reſerved for meaner ſpirits. If the paſſions can be gratified without the painful conſequences of ſupporting a family, they eagerly ſeize the indulgence. But the toil of education they leave to thoſe whom they deem fools enough to take a pleaſure in it. There will always be a ſufficient number, ſay they, whoſe folly will lead them, for the ſake of a ſilly paſſion called virtuous love, to engage in a life of perpetual anxiety. The fool's paradiſe, they add with deriſion, will never be deſerted.

"Preſumptuous as are all ſuch pretenders to newly-invented ſyſtems of life and conduct, it is not to be ſuppoſed they will think themſelves ſuperior to Cicero. Yet Cicero, with all his liberality of mind, felt the tenderneſs of conjugal and paternal attachment, and acknowledged that, at one time, he received no ſatiſfaction in any company but that of his wife, his little daughter, and, to uſe his own epithet, his HONIED young Cicero. The great Sir Thomas More, whom nobody will ſuſpect of narrowneſs of mind, who by a very ſingular treatiſe evinced that he was capable of thinking and of chooſing for himſelf, has left it on record that he devoted a great ſhare of his time, from the united motives of duty and delight, to the amuſement of his children.

"It will be objected by thoſe who pretend to have formed their ideas of life from actual obſervation, that domeſtic happineſs, however pleaſing in deſcription, like many a poetic dream, is but an alluring picture, deſigned by a good heart, and painted in glowing colours by a lively fancy. The conſtant company, they urge, even of thoſe we love, occaſions an inſipidity. Inſipidity grows into diſguſt. Diſguſt, long continued, ſours the temper. Peeviſhneſs is the natural conſequence. The domeſtic circle becomes the ſcene of diſpute. Mutual antipathy is ingenious in deviſing mutual torment. Sullen ſilence or malignant remarks fill up every hour, till the arrival of a ſtranger cauſes a temporary reſtraint, and excites that good humour which ought to be diſplayed among thoſe whom the bonds of affection and blood have already united.

"Experience, indeed, proves that theſe remarks are ſometimes verified. But that there is much domeſtic miſery is no argument that there is no domeſtic happineſs, or that the evil may not be removed. Natural ſtupidity, natural ill temper, acquired ill habits, want of education, illiberal manners, and a neglect of the common rules of diſcretion, will render every ſpecies of intercourſe diſagreeable. When thoſe are united by connubial ties who were ſeparated by natural and inherent diverſity, no wonder if that degree of happineſs which can only reſult from a proper union, is unknown. In the forced alliance, which the poet of Venuſium mentions, of the ſerpent with the dove, of the tyger with the lamb, there can be no love. When we expatiate on the happineſs of the domeſtic groupe, we preſuppoſe that all who compoſe it are originally aſſimilated by affection, and are ſtill kept in union by diſcreet friendſhip. Where this is not the caſe, the cenſure muſt fall on the diſcordant diſpoſition of the parties, and not on the eſſential nature of family intercourſe.

"To form, under the direction of prudence, and by the impulſe of virtuous love, an early conjugal attachment, is one of the beſt ſecurities of virtue, as well as the moſt probable means of happineſs. The duties, which are powerfully called forth by the relations of huſband and father, are of that tender kind which inſpires goodneſs and humanity. He who beholds a woman whom he loves, and an helpleſs infant, looking up to him for ſupport, will not eaſily be induced to indulge in unbecoming extravagance, or devote himſelf to indolence. He who has a riſing family to introduce into a vicious world, will be cautious of ſetting a bad example, the contagion of which, when it proceeeds from parental authority, muſt be irreſiſtibly malignant. Thus many who, in their individual and unconnected ſtate, would probably have ſpent a life not only uſeleſs to others, but profligate and careleſs in itſelf, have become valuable members of the community, and have arrived at a degree of moral improvement, to which they would not otherwiſe have attained.

"The contempt in which domeſtic pleaſures have in modern times been held, is a mark of profligacy. It is alſo a proof of a prevailing ignorance of real enjoyment. It argues a defect in taſte and judgment as well as in morals. For the general voice of the experienced has in all ages declared, that the trueſt happineſs is to be found at home."

DOMICILE, in Scots law, is the dwelling-place where a perſon lives with an intention to remain.

DOMIFYING, in aſtrology, the dividing or diſtributing the heavens into 12 houſes, in order to erect a theme, or horoſcope, by means of ſix great circles, called *circles of poſition*.

There are various ways of domifying: that of Regiomontanus, which is the moſt common, makes the circles of poſition paſs through the interſections of the meridian and the horizon: others make them paſs through the poles of the zodiac.

DOMINANT (from the Latin word *dominari* "to rule or govern"), among muſicians, is uſed either as an adjective or ſubſtantive; but theſe different acceptations are far from being indiſcriminate. In both ſenſes it is explained by Rouſſeau as follows.

The *dominant* or ſenſible chord is that which is practiſed upon the dominant of the tone, and which introduces a perfect cadence. Every perfect major chord becomes a *dominant* chord, as ſoon as the ſeventh minor is added to it.

*Dominant* (ſubſt.). Of the three notes eſſential to the tone, it is that which is a fifth from the tonick. The tonick and the *dominant* fix the tone; in it they are each of them the fundamental ſound of a particular chord; whereas the mediant, which conſtitutes the mode, has no chord peculiar to itſelf, and only makes a part of the chord of the tonick.

Mr Rameau gives the name of *dominant* in general to every note which carries a chord of the ſeventh, and diſtinguiſhes that which carries the ſenſible chord by the name of a *tonick dominant*; but, on account of the length of the word, this addition to the name has not been adopted by artiſts: they continue ſimply to call that note a *dominant* which is a fifth from the tonick; and they do not call the other notes which carry a chord of the ſeventh *dominants*, but *fundamentals*; which is ſufficient to render their meaning plain, and prevents confuſion.

A *dominant*, in that ſpecies of church-muſic which is called *plain-chant*, is that note which is moſt frequently repeated or beaten, in whatever degree it may be from the tonick. In this ſpecies of muſic there are *dominants* and *tonicks*, but no mediant.

DOMINATION, or DOMINION, in theology, the fourth order of angels or bleſſed ſpirits in the hierarchy, reckoning from the ſeraphim. See ANGEL.

DOMINGO, or St DOMINGO, the capital of the iſland of Hiſpaniola in the Weſt Indies, is ſeated in that part belonging to the Spaniards on the ſouth ſide of the iſland, and has a commodious harbour. The town is built in the Spaniſh manner, with a great ſquare in the middle of it; about which are the cathedral and other public buildings. From this ſquare run the principal ſtreets, in a direct line, they being croſſed by others at right angles, ſo that the form of the town is almoſt ſquare. The country on the north and eaſt ſide is pleaſant and fruitful; and there is a large navigable river on the weſt, with the ocean on the ſouth. It is the ſee of an archbiſhop, an ancient royal audience, and the ſeat of the governor. It has ſeveral fine churches and monaſteries; and is ſo well fortified, that a fleet and army ſent by Oliver Cromwell in 1654 could not take it. The inhabitants are Spaniards, Negroes, Mulattoes, Meſtices, and Albatraces; of whom about a ſixth part may be Spaniards. It had formerly about 2000 houſes, but it is much declined of late years. The river on which it is ſeated is called *Ozama*. W. Long. 69. 30. N. Lat. 18. 25.

DOMINIC (de Guſman), founder of the Dominican order of monks, was born at Calaroga in Old Caſtile, 1170. He preached with great fury againſt the Albigenſes, when Pope Innocent III. made a croiſade againſt that unhappy people; and was inquiſitor in Languedoc, where he founded his order, and got it confirmed by the Lateran council in 1215. He died at Bologna in 1221, and was afterwards canonized. The dominican order has produced many illuſtrious men. See Dominicans.

DOMINICA, one of the Caribbee iſlands in the Weſt Indies, about 39 miles long and 13 broad, ſituated between 61° and 62° W. Long. and between 15° and 16° of N. Lat. This iſland formerly belonged to the French, but was ceded to Britain by the treaty in 1763. It is very advantageous to the latter, as being ſituated between the French iſlands of Gaudaloupe and Martinico, ſo that it is equally alarming to both; and its ſafe and commodious roads enable the Britiſh privateers to intercept, without riſk, the navigation of France in her colonies, whenever a war happens between the two nations.

This iſland was reduced, in the year 1778, by the French, under the marquis de Bouille, governor of Martinico. At that time the iſland, though very well fortified, had been unaccountably neglected by the Britiſh government, in ſuch a manner as to be almoſt entirely deſtitute of a garriſon. The French commander therefore, who made a deſcent with 2000 men, found only 100 regular forces and a few companies of militia to oppoſe him. All reſiſtance therefore being vain, the only thing the garriſon could do was to procure as favourable terms of capitulation as poſſible. Theſe were granted with ſuch readineſs as did great honour to the character of this officer; the inhabitants experiencing no kind of change except that of transferring their obedience from Britain to France, being left unmoleſted in the enjoyment of all their rights both civil and religious. The capitulation was ſtrictly obſerved by the Marquis; no plunder or irregularity being allowed, and a pecuniary gratification being diſtributed among the ſoldiers and volunteers who accompanied him in the expedition. An hundred and ſixty-four pieces of excellent cannon, and twenty-four braſs mortars, beſides a large quantity of military ſtores, were found in the place; inſomuch that the French themſelves expreſſed their ſurpriſe at finding ſo few hands to make uſe of them. The Marquis, however, took care to ſupply this defect, by leaving a garriſon of 1500 of the beſt men he had with him. It was reſtored to Britain at the concluſion of the peace in 1783.

*La Dominica*, one of the Marquesas Iſlands in the South-Sea.

DOMINICAL letter, popularly called *Sunday-Letter*, one of the ſeven letters A B C D E F G, uſed in almanacks, ephemerides, &c. to denote the Sundays throughout the year. See Chronology, n° 32. The word is formed from *dominica* or *dominicus dies*, "Lord's-day, Sunday."

The dominical letters were introduced in the kalendar by the primitive Chriſtians, in lieu of the nundinal letters in the Roman kalendar.

Dominical, in church-hiſtory. The council of Auxerre, held in 578, decrees, that women communicate with their dominical Some authors contend, that this dominical was a linen cloth, wherein they received the ſpecies; as not being allowed to receive them in the bare hand. Others will have it a kind of veil, wherewith they covered the head. The moſt probable account is, that it was a ſort of linen cloth or handkerchief wherein they received and preſerved the euchariſt in times of perſecution, to be taken on occaſion at home. This appears to have been the caſe by the practice of the firſt Chriſtians, and by Tertullian's book *Ad Uxorem*.

DOMINICANS, an order of religious, called in ſome places *Jacobins;* and in others, *Predicants*, or *Preaching Friers*.

The Dominicans take their name from their founder Dominic de Guzman, a Spaniſh gentleman, born in 1170, at Calaroga in Old Caſtile. He was firſt canon and archdeacon of Oſma; and afterwards preached with great zeal and vehemence againſt the Albigenſes in Languedoc, where he laid the firſt foundation of his order. It was approved of in 1215 by Innocent III. and confirmed in 1216 by a bull of Honorius III. under the tile of *St Auguſtin;* to which Dominic added ſeveral auſtere precepts and obſervances, obliging the brethren to take a vow of abſolute poverty, and to abandon entirely all their revenues and poſſeſſions; and alſo the title of *Preaching Friers*, becauſe public inſtruction was the main end of their inſtitution.

The firſt convent was founded at Tholouſe by the biſhop thereof and Simon de Montfort. Two years afterwards they had another at Paris, near the biſhop's houſe; and ſome time after a third in the rue St Jacques, St James's ſtreet, whence the denomination of *Jacobins*.

Juſt before his death, Dominic ſent Gilbert de Freſney, with twelve of the brethren, into England, where they founded their firſt monaſtery at Oxford in the year 1221, and ſoon after another at London. In the year 1276, the mayor and aldermen of the city of London gave them two whole ſtreets by the river Thames, where they erected a very commodious convent, whence that place is ſtill called *Black Friers*, from the name by which the Dominicans were called in England.

St Dominic, at firſt, only took the habit of the regular canons; that is, a black caſſock and rochet: but this he quitted in 1219, for that which they now wear, which it is pretended was ſhown by the bleſſed Virgin herſelf to the beatified Renaud d'Orleans.

This order is diffuſed throughout the whole known world. It has forty-five provinces under the general, who reſides at Rome; and twelve particular congregations or reforms, governed by vicars general.

They reckon three popes of this order, above ſixty cardinals, ſeveral patriarchs, a hundred and fifty archbiſhops, and about eight hundred biſhops; beſide maſters of the ſacred palace, whoſe office has been conſtantly diſcharged by a religious of this order, ever ſince St Dominic, who held it under Honorius III. in 1218.

Of all the monaſtic orders, none enjoyed a higher degree of power and authority than the Dominican friers, whoſe credit was great, and their influence univerſal. But the meaſures they uſed in order to maintain and extend their authority were ſo perfidious and cruel, that their influence began to decline towards the beginning of the ſixteenth century. The tragic ſtory of Jetzer, conducted at Bern in 1509, for determining an unintereſting diſpute between them and the Franciſcans, relating to the *immaculate conception*, will reflect indelible infamy on this order. See an account of it in Burnet's Travels through France, Italy, Germany, and Switzerland, p. 31. or Moſheim's Eccl. Hiſt. vol. iii. p. 294, 8vo. They were indeed perpetually employed in ſtigmatizing with the opprobrious name of hereſy numbers of learned and pious men; in encroaching upon the rights and properties of others, to augment their poſſeſſions; and in laying the moſt iniquitous ſnares and ſtratagems for the deſtruction of their adverſaries. They were the principal counſellors, by whoſe inſtigation and advice Leo X. was determined to the public condemnation of Luther. The papal ſee never had more active and uſeful abettors than this order, and that of the Jeſuits.

The dogmata of the Dominicans are uſually oppoſite to thoſe of the Franciſcans.

There are alſo nuns or ſiſters of this order, called in ſome places *Preaching Siſters*. Theſe are even more ancient than the friers; St Dominic having founded a ſociety of religious maids at Prouilles ſome years before the inſtitution of his order of men; viz. in 1206.

There is alſo a third order of Dominicans, both for men and women.

DOMINION, DOMINIUM, in the civil law, ſignifies the power to uſe or diſpoſe of a thing as we pleaſe.

DOMINION, or *Domination*. See DOMINATION.

DOMINIS (Mark Anthony de), archbiſhop of Spalatro in Dalmatia at the cloſe of the 15th and beginning of the 16th centuries, was a man whoſe fickleneſs in religion proved his ruin. His preferment, inſtead of attaching him to the church of Rome, rendered him diſaffected to it. Becoming acquainted with our biſhop Bedell, while chaplain to Sir Henry Wotton ambaſſador from James I. at Venice, he communicated his books *De Republica Eccleſiaſtica* to him; which were afterwards publiſhed at London, with Bedell's corrections. He came to England with Bedell; where he was received with great reſpect, and preached and wrote againſt the Romiſh religion. He is ſaid to have had a principal hand in publiſhing father Paul's *Hiſtory of the Council of Trent*, at London, which was inſcribed to James in 1619. But on the promotion of Pope Gregory XIV. who had been his ſchool-fellow and old acquaintance, he was deluded by Gondomar the Spaniſh ambaſſador into the hopes of procuring a cardinal's hat, by which he fancied he ſhould prove an inſtrument of great reformation in the church. Accordingly he returned to Rome in 1622, recanted his errors, and was at firſt well received: but he afterwards wrote letters to England, repenting his recantation; which being intercepted, he was impriſoned by Pope Urban VIII. and died in 1625. He was alſo the author of the firſt philoſophical explanation of the rainbow, which before his time was accounted a prodigy.

DOMINIUM EMINENS, in Scots law, that power which the ſtate or ſovereign has over private property, by which the proprietor may be compelled to ſell it for an adequate price where public utility requires. See LAW, N° clxii. 1.

*DOMINIUM Directum*, in Scots law, the right which a ſuperior retains in his lands, notwithſtanding the feudal grant to his vaſſal. See LAW, N° clxvi. 1.

*DOMINIUM Utile*, in Scots law, the right which the vaſſal acquires in the lands by the feudal grant from his ſuperior. See LAW, N° clxvi. 1.

DOMINUS, in ancient times, a title prefixed to a name, uſually to denote the perſon either a knight or a clergyman. See *VICE-Dominus*.

The title was ſometimes alſo given to a gentleman not dubbed; eſpecially if he were lord of a manor. See DOM, GENTLEMAN, and SIRE.

In Holland, the title *dominus* is ſtill retained, to diſtinguiſh a miniſter of the reformed church.

DOMITIAN, the Roman emperor, ſon to Veſpaſian, was the laſt of the 12 Cæſars. See *(Hiſtory of)* ROME.

DON, or TANAIS, a river of Ruſſia, which takes its riſe from the ſmall lake of St John, near Tula, in the government of Moſcow, and paſſing through part of the province of Voronetz, a ſmall portion of the Ukraina-Slobodſkaia, and the whole province of Azof, divides itſelf near Tcherkaſk into three ſtreams, and falls in theſe ſeparate branches into the Sea of Azof. The river has ſo many windings, is in many parts ſo ſhallow, and abounds with ſuch numerous ſhoals, as to be ſcarcely navigable, excepting in the ſpring, upon the melting of the ſnows; and its mouth is alſo ſo choaked up with ſand, that only flat-bottomed veſſels, excepting in the ſame ſeaſon, can paſs into the ſea of Azof. The banks of the Don, and the rivulets which fall into it, are clothed with large tracts of foreſt, whoſe timber is floated down the ſtream to St Demetri and Roſtof, where the frigates for the ſea of Azof are chiefly conſtructed. The navigation of the Don, Mr Cox obſerves, may poſſibly hereafter be rendered highly valuable, by conveying to the Black Sea the iron of Siberia, the Chineſe goods, and the Perſian merchandize: which latter commodities, as well as the products of India, formerly found their way into Europe through this ſame channel.

DON is alſo the name of a river in Scotland, noticed under the article ABERDEEN; the Old Town being ſituated at its mouth. See ABERDEEN.

DONARIA, among the ancients, in its primary ſignification, was taken for the places where the oblations offered to the gods were kept; but afterwards was uſed to denote the offerings themſelves; and ſometimes, though improperly, the temples.

DONATIA, in botany: A genus of the trigynia order, belonging to the triandria claſs of plants. The calyx is a triphyllous perianthium, with ſhort ſubulated leaves ſtanding at a diſtance from one another. The corolla has from eight to ten petals of an oblong linear ſhape, twice as long as the calyx. The ſtamina are three ſubulated filaments the length of the calyx; the antheræ roundiſh, didymous, and two-lobed at the baſe.

DONATION, DONATIO, an act or contract whereby a man transfers to another either the property or the uſe of the whole or a part of his effects as a free gift.

A donation, to be valid and complete, ſuppoſes a capacity both in the donor and the donee; and requires conſent, acceptance, and delivery; and by the French law regiſtry alſo.

*DONATION Mortis Cauſa*, in law, a diſpoſition of property made by a perſon in his laſt ſickneſs, who apprehending

hending his diſſolution near, delivers, or cauſes to be delivered to another, the poſſeſſion of any perſonal goods, to keep in caſe of his deceaſe. If the donor dies, this gift needs not the conſent of his executor; but it ſhall not prevail againſt creditors; and it is accompanied with this implied truſt, that, if the donor lives, the property ſhall revert to himſelf, being only given in proſpect of death, or *mortis cauſa*. This method of donation ſeems to have been conveyed to us from the civil lawyers, who borrowed it from the Greeks.

**DONATISTS**, ancient ſchiſmatics in Africa, ſo denominated from their leader Donatus.

They had their origin in the year 311, when, in the room of Menſurius, who died in that year on his return to Rome, Cæcilian was elected biſhop of Carthage, and conſecrated without the concurrence of the Numidian biſhops, by thoſe of Africa alone; whom the people refuſed to acknowledge, and to whom they oppoſed Majorinus; who, accordingly, was ordained by Donatus biſhop of Caſæ Nigræ. They were condemned, in a council held at Rome, two years after their ſeparation; and afterwards in another at Arles, the year following; and again at Milan, before Conſtantine the Great, in 316, who deprived them of their churches, and ſent their ſeditious biſhops into baniſhment, and puniſhed ſome of them with death. Their cauſe was eſpouſed by another Donatus, called the *great*, the principal biſhop of that ſect, who, with numbers of his followers, was exiled by order of Conſtans. Many of them were puniſhed with great ſeverity. See Circumcelliones. However, after the acceſſion of Julian to the throne in 362, they were permitted to return, and reſtored to their former liberty. Gratian publiſhed ſeveral edicts againſt them; and in 377 deprived them of their churches, and prohibited all their aſſemblies. But notwithſtanding the ſeverities they ſuffered, it appears that they had a very conſiderable number of churches towards the cloſe of this century; but at this time they began to decline, on account of a ſchiſm among themſelves, occaſioned by the election of two biſhops, in the room of Parmenian, the ſucceſſor of Donatus; one party elected Primian, and were called *Primianiſts*, and another Maximian, and were called *Maximianiſts*. Their decline was alſo precipitated by the zealous oppoſition of St Auguſtin, and by the violent meaſures which were purſued againſt them, by order of the emperor Honorius, at the ſolicitation of two councils held at Carthage; the one in 404, and the other in 411. Many of them were fined, their biſhops were baniſhed, and ſome put to death. This ſect revived and multiplied under the protection of the Vandals, who invaded Africa in 427, and took poſſeſſion of this province; but it ſunk again under new ſeverities, when their empire was overturned in 534. Nevertheleſs, they remained in a ſeparate body till the cloſe of this century, when Gregory, the Roman pontiff, uſed various methods for ſuppreſſing them; his zeal ſucceeded, and there are few traces to be found of the Donatiſts after this period. They were diſtinguiſhed by other appellations; as *Circumcelliones*, *Montenſes*, or *Mountaineers*, *Campites*, *Rupites*, &c. They held three councils, or conciliabules; that of Cirta in Numidia, and two at Carthage.

The errors of the Donatiſts, beſide their ſchiſm, were, 1. That baptiſm conferred out of the church, that is, out of their ſect, was null; and accordingly they rebaptized thoſe who joined their party from other churches, and re-ordained their miniſters. 2. That theirs was the only true, pure, and holy church; all the reſt of the churches they held as proſtitute and fallen.

Donatus ſeems likewiſe to have given into the doctrine of the Arians, with whom he was cloſely allied; and, accordingly, St Epiphanius, Theodoret, and ſome others, accuſed the Donatiſts of Arianiſm; and it is probable that the charge was well founded, becauſe they were patronized by the Vandals, who were of theſe ſentiments. But St Auguſtine, ep. 185, to count Bonniface, & Hær. 69. affirms, that the Donatiſts, in this point, kept clear of the errors of their leader.

**DONATIVE**, Donativum, a preſent made by any perſon; called alſo *gratuity*.

The Romans made large donatives to their ſoldiers. Julia Pia, wife of the emperor Severus, is called on certain medals *mater caſtrorum*, becauſe of the care ſhe took of the ſoldiery, by interpoſing for the augmentation of their donatives, &c.

Donative was properly a gift made to the ſoldiery; as congiarium was that made to the people. Salmaſius, on his notes to Lampridius, in his Life of Heliogabalus, mentioning a donative that emperor gave of three pieces of gold *per* head, obſerves, that this was the common and legitimate rate of a donative. Caſaubon, in his notes on the Life of Pertinax by Capitolinus, obſerves, that Pertinax made a promiſe of 3000 denarii to each ſoldier; which amounts to upwards of 97 pounds ſterling. The ſame author writes, that the legal donative was 20,000 denarii; and that it was not cuſtomary to give leſs, eſpecially to the prætorian ſoldiers; that the centurions had double, and the tribunes, &c. more in proportion.

**Donative**, in the canon law, a benefice given, and collated to a perſon, by the founder or patron; without either preſentation, inſtitution, or induction by the ordinary.

If chapels founded by laymen be not approved by the dioceſan, and, as it is called, *ſpiritualized*, they are not accounted proper benefices, neither can they be conferred by the biſhop, but remain to the pious diſpoſition of the founders; ſo that the founders, and their heirs, may give ſuch chapels without the biſhop.

Gwin obſerves, that the king might of ancient time found a free chapel, and exempt it from the juriſdiction of the dioceſan; ſo may he, by letters patent, give liberty to a common perſon to found ſuch a chapel, and make it donative, not preſentable; and the chaplain, or beneficiary, ſhall be deprivable by the founder or his heir, and not by the biſhop. And this ſeems to be the original of donatives in England.

Donatives are within the ſtatute againſt ſimony; and if they have cure of ſouls, within that againſt pluralities. If the patron of a donative doth not nominate a clerk, there can be no lapſe thereof, unleſs it be ſpecially provided for in the foundation; but the biſhop may compel him to do it by ſpiritual cenſures. But if it be augmented by queen Anne's bounty, it will lapſe like other preſentative livings. 1 Geo. I. ſtat.

Plate CLXIV.

A. Bell Prin. Wal. Sculptor fecit.

2. cap. 10. The ordinary cannot viſit a donative, and therefore it is free from procuration, and the incumbent is exempted from attendance at viſitations.

All biſhopricks in ancient time were donative by the king. Again, where a biſhop has the gift of a benefice, it is properly called a *donative*, becauſe he cannot preſent to himſelf.

DONATORY, in Scots law, that perſon to whom the king beſtows his right to any forfeiture that has fallen to the crown.

DONATUS, a ſchiſmatic biſhop of Carthage, founder of the ſect of Donatists. His followers ſwore by him, and honoured him like a god. He died about 368.

Donatus (Ælius), a famous grammarian, lived at Rome in 354. He was one of St Jerome's maſters; and compoſed commentaries on Terence and Virgil, which are eſteemed.

DONAWERT, a ſtrong town of Germany, in the circle of Bavaria on the frontiers of Suabia. It has been taken and retaken ſeveral times in the wars of Germany; and was formerly an imperial city, but at preſent is ſubject to the duke of Bavaria. E. Long. 10. 32. N. Lat. 48. 32.

DONAX, a genus of inſects belonging to the order of vermes teſtacea. It is an animal of the oyſter kind; and the ſhell has two valves, with a very obtuſe margin in the fore-part. There are 10 ſpecies, principally diſtinguiſhed by the figure of their ſhells.*

ate
XIV.

DONCASTER, a market-town of Yorkſhire, 30 miles ſouth of York. It was noted for knitting worſted ſtockings; that article of their trade is now on the decline. Doncaſter gives the Engliſh title of Earl to the duke of Buccleugh in Scotland, which belonged to his anceſtor the duke of Monmouth, but was omitted out of the forfeiture. W. Long. 1. 0. N. Lat. 53. 30.

DONNE (Dr John), an excellent poet and divine of the 7th century. His parents were of the Romiſh religion, and uſed their utmoſt efforts to keep him firm to it; but his early examination of the controverſy between the church of Rome and the Proteſtants, at laſt determined him to chooſe the latter. He travelled into Italy and Spain; where he made many uſeful obſervations, and learned their languages to perfection. Soon after his return to England, Sir Thomas Egerton, keeper of the great ſeal, appointed him his ſecretary; in which poſt he continued five years. He marrying privately Anne the daughter of Sir George Moore then chancellor of the garter, and niece to the lord keeper's lady, was diſmiſſed from his place, and thrown into priſon. But he was reconciled to Sir George by the good offices of Sir Francis Wolley. In 1612, he accompanied Sir Robert Drury to Paris. During this time, many of the nobility ſolicited the king for ſome ſecular employment for him. But his majeſty, who took pleaſure in his converſation, had engaged him in writing his *Pſeudo Martyr*, printed at London in 1610; and was ſo highly pleaſed with that work, that in 1614 he prevailed with him to enter into holy orders; appointed him one of his chaplains, and procured him the degree of Doctor of Divinity from the univerſity of Oxford. In 1619, he attended the earl of Doncaſter in his embaſſy into Germany. In 1621, he was made dean of St Paul's: and the vicarage of St Dunſtan in the weſt, in London, ſoon after fell to him; the advowſon of it having been given to him long before by Richard earl of Dorſet. By theſe and other preferments, he was enabled to be charitable to the poor, kind to his friends, and to make good proviſion for his children. He wrote, beſides the above, 1. Devotions upon emergent occaſions. 2. The Ancient Hiſtory of the Septuagint, tranſlated from the Greek of Ariſteus, quarto. 3. Three volumes of ſermons, folio. 4. A conſiderable number of poems; and other works. He died in 1631; and was interred in St Paul's cathedral, where a monument was erected to his memory. His writings ſhow him to be a man of incomparable wit and learning; but his greateſt excellence was ſatire. He had a prodigious richneſs of fancy, but his thoughts were much debaſed by his verſification. He was, however, highly celebrated by all the great men of that age.

DONOR, in law, the perſon who gives lands or tenements to another in tail, &c.; as he to whom ſuch lands, &c. are given, is the *donee*.

DOOMSDAY book. See Domesday *Book*.

DOOR, in architecture. See Architecture, n°76.

DOR, the Engliſh name of the common black beetle. Some apply it alſo to the duſty beetle, that flies about hedges in the evening. See Scarabæus.

DORADO, in aſtronomy, a ſouthern conſtellation, not viſible in our latitude; it is alſo called *xiphias*. The ſtars of this conſtellation, in Sharp's Catalogue, are ſix.

DORCHESTER, the capital of Dorſetſhire, ſituated on the river Froom, ſix miles north of Weymouth: W. Long. 2. 35. N. Lat. 50. 40. It gives the title of marquis to the noble family of Pierpoint, duke of Kingſton; and ſends two members to parliament.

DOREE, or John Doree, in ichthyology. See Zeus.

DORIA (Andrew), a gallant Genoeſe ſea-officer, born in 1466. He entered into the ſervice of Francis I. of France; but preſerved that ſpirit of independence ſo natural to a ſailor and a republican. When the French attempted to render Savona, long the object of jealouſy to Genoa, its rival in trade, Doria remonſtrated againſt the meaſure in a high tone; which bold action, repreſented by the malice of his courtiers in the moſt odious light, irritated Francis to that degree, that he ordered his admiral Barbeſieux to ſail to Genoa, then in the hands of the French troops, to arreſt Doria, and to ſeize his galleys. This raſh order Doria got timely hints of; retired with all his galleys to a place of ſafety; and, while his reſentment was thus raiſed, he cloſed with the offers of the emperor Charles V. returned his commiſſion with the collar of St Michael to Francis, and hoiſted the Imperial colours. To deliver his country, weary alike of the French and Imeprial yoke, from the dominion of foreigners, was now Doria's higheſt ambition; and the favourable moment offered. Genoa was afflicted with the peſtilence, the French garriſon was greatly reduced and ill-paid, and the inhabitants were ſufficiently diſpoſed to ſecond his views. He ſailed to the harbour with 13 galleys, landed 500 men, and made himſelf maſter of the gates and the palace with very little reſiſtance. The French governor with his feeble garriſon retired to the citadel, but was quickly forced to capitulate; when the people ran together, and levelled the citadel with the ground. It was now in Doria's power to have rendered himſelf the ſovereign of his country; but, with a magnanimity of which there are few examples, he aſſembled the people in the court before the palace, diſclaimed all pre-eminence, and recommended to them to ſettle that form of government they choſe to eſtabliſh. The people, animated by his ſpirit, forgot their factions, and fixed that form of government which has ſubſiſted ever ſince with little variation. This event happened in 1528. Doria lived to a great age, reſpected and beloved as a private citizen; and is ſtill celebrated in Genoa by the moſt honourable of all appellations, "The father of his country, and the reſtorer of its liberty."

DORIC, in general, any thing belonging to the Dorians, an ancient people of Greece, inhabiting near mount Parnaſſus. See DORIS.

DORIC, in architecture, is the ſecond of the five orders; being that between the Tuſcan and Ionic. It is uſually placed upon the Attic baſe, though originally it had no baſe. See ARCHITECTURE, n° 43.

At its firſt invention it was more ſimple than at preſent; and when in after-times they came to adorn and enrich it more, the appellation *Doric* was reſtrained to this richer manner, and the primitive ſimple manner they called by a new name, the Tuſcan order, which was chiefly uſed in temples; as the former, being more light and delicate, was for porticos and theatres. The tradition is, that Dorus, king of Achaia, having firſt built a temple of this order at Argos, which he dedicated to Juno, occaſioned it to be called *Doric;* though others derive its name, from its being invented or uſed by the Dorians.

The moderns, on account of its ſolidity, uſe it in large ſtrong buildings; as in the gates of cities and citadels, the outſides of churches, and other maſſy works, where delicacy of ornaments would be unſuitable. The gate of Burlington-houſe in Piccadilly is of the Doric order.

The moſt conſiderable antient monuments of this order, are the theatre of Marcellus at Rome; wherein the capital, the height of the frize, and its projecture, are much ſmaller than in the modern architecture; and the Parthenion, or temple of Minerva at Athens, in which the ſhort and maſſy columns bear upon the pavement without a baſe; and the capital is a ſimple torus, with its cincture, and a ſquare, plain, and ſolid abacus.

*DORIC Cymatium.* See CYMA.

*DORIC Dialect*, one of the five dialects, or manners of ſpeaking, which obtained among the Greeks.

It was firſt uſed by the Lacedemonians, and particularly thoſe of Argos; thence it paſſed into Epirus, Libya, Sicily, the iſlands of Rhodes, and Crete. In this dialect, Archimedes and Theocritus wrote, who were both of Syracuſe; as likewiſe Pindar.

In ſtrictneſs, however, we ſhould rather define Doric, the manner of ſpeaking peculiar to the Dorians, after their receſs near Parnaſſus and Aſopus; and which afterwards came to obtain among the Lacedemonian, &c. Some even diſtinguiſh between the Lacedemonian and Doric; but, in reality, they were the ſame; ſetting aſide a few particularities in the language of the Lacedemonians; as is ſhown by Rulandus, in his excellent treatiſe *De Lingua Græca ejuſque Dialectis*, lib. v.

Beſide the authors already mentioned to have written in the Doric dialect, we might add Archytas of Tarentum, Bion, Callinus, Simonides, Bacchylides, Cypſelas, Alcman, and Sophron.

Moſt of the medals of the cities of Græcia Magna, and Sicily, favour of the Doric dialect in their inſcription: witneſs, ΑΜΕΡΑΚΙΩΤΑΝ, ΑΠΟΛΛΩΝΙΑΤΑΝ, ΑΧΕΡΟΝΤΑΝ, ΑΧΥΡΙΤΑΝ, ΗΡΑΧΛΕΩΤΑΝ, ΤΡΑΧΙΝΙΩΝ, ΘΕΡΜΙΤΑΝ, ΚΑΤΑΟΝΙΑΤΑΝ, ΚΟΠΙΑΤΑΝ, ΤΑΥΡΟΜΕΝΙΤΑΝ, &c. Which ſhows the countries wherein the Doric dialect was uſed.

The general rules of this dialect are thus given by the Port-royaliſts.

> *D'ε Ητα, d'ω grand, d'ε, ω & d'υ l'α fait le Dore.*
> *D'ει fait ητα; d'υ, ω; & d'ᾳ αυ fait encore.*
> *Oſte ι de l'infini: & pour le ſingulier*
> *Se ſert au ſemenin du nombre plurier.*

But they are much better explained in the fourth book of Rulandus; where he even notes the minuter differences of the dialects of Sicily, Crete, Tarentum, Rhodes, Lacedæmon, Laconia, Macedonia, and Theſſaly.

The *a* abounds every where in the Doric; but this dialect bears ſo near a conformity with the Æolic, that many reckon them but one.

*DORIC Mode*, in muſic, the firſt of the authentic modes of the ancients. Its character is to be ſevere, tempered with gravity and joy; and is proper upon religious occaſions, as alſo to be uſed in war. It begins *D*, *la*, *ſol*, *re*. Plato admires the muſic of the Doric mode, and judges it proper to preſerve good manners as being maſculine; and on this account allows it in his commonwealth. The ancients had likewiſe their ſubdoric or hypodoric mode, which was one of the plagal modes. Its character was to be very grave and ſolemn: it began with *re*, a fourth lower than the doric.

DORING, or DARING, among ſportſmen, a term uſed to expreſs a method of taking larks, by means of a clap-net and a looking-glaſs. For this ſport there muſt be provided four ſticks very ſtraight and light, about the bigneſs of a pike; two of theſe are to be four feet nine inches long, and all notched at the edges or the ends. At one end of each of theſe ſticks there is to be faſtened another of about a foot long on one ſide; and on the other ſide a ſmall wooden peg about three inches long. Then four or more ſticks are to be prepared, each of one foot length; and each of theſe muſt have a cord of nine feet long faſtened to it at the end. Every one ſhould have a buckle for the commodious faſtening on to the reſpective ſticks when the net is to be ſpread. A cord muſt alſo be provided, which muſt have two branches. The one muſt have nine feet and a half, and the other ten feet long, with a buckle at the end of each; the reſt, or body of the cord, muſt be 24 yards long. All theſe cords, as well the long ones as thoſe about the ſticks, muſt be well twiſted and of the bigneſs of one's little finger. The next thing to be provided is a ſtaff of four feet long, pointed at one end, and with a ball of wood at the other, for the carrying theſe conveniences in a ſack or wallet — There ſhould alſo be carried, on this occaſion, a ſpade to to level the ground where there may be any little irregularities; and two ſmall rods, each 18 inches long, and having a ſmall rod fixed with a pack-thread at the larger end of the other. To theſe are to be tied ſome pack-thread loops, which are to faſten in the legs of ſome larks; and there are to be reels to theſe, that the birds may fly a little way up and down. When all this is done, the looking-glaſs is to be prepared in the following manner. Take a piece of wood about an inch and an half thick, and cut it in form of a bow, ſo that there may be about nine inches ſpace between the two ends; and let it have its full thickneſs at the bottom, that it may receive into it a falſe piece; in the five corners of which there are to be ſet in five pieces of looking-glaſs. Theſe are ſo fixed that they may dart their light upwards; and the whole machine is to be ſupported on a moveable pin, with the end of a long line fixed to it, and made in the manner of the children's play-thing of an apple and a plum-ſtone; ſo that the other end of the cord being carried through a hedge, the barely pulling it may ſet the whole machine of the glaſſes a-turning. This and the other contrivances are to be placed in the middle between the two nets. The larks fixed to the place, and termed *calls*, and the glittering of the looking-glaſſes as they twirl round in the ſun, invite the other larks down; and the cord that communicates with the nets, and goes through the hedge, gives the perſon behind an opportunity of pulling up the nets, ſo as to meet over the whole, and take every thing that is between them. The places where this ſort of ſporting ſucceeds beſt are open fields remote from any trees and hedges except one by way of ſhelter for the ſportſman: and the wind ſhould always be either in the front or back; for if it blows ſideways, it prevents the playing of the net.

DORIS, a country of Greece, between Phocis, Theſſaly, and Acarnania. It received its name from Dorus the ſon of Deucalion, who made a ſettlement there. It was called *Tetrapolis* from the four cities of Pindus or Dryopis, Erineum, Cytinium, Borium, which it contained. To theſe four ſome add Lilæum and Carphia. and therefore call it *Hexapolis*. The name of Doris has been common to many parts of Greece. The Dorians in the age of Deucalion inhabited Phthiotis, which they exchanged for Hiſtiæotis, in the age of Dorus. From thence they were driven by the Cadmeans, and came to ſettle near the town of Pindus. From thence they paſſed into Dryopis, and afterwards into Peloponnèſus. Hercules having re-eſtabliſhed Ægimius king of Phthiotis or Doris, who had been driven from his country by the Lapithæ, the grateful king appointed Hyllus the ſon of his patron to be his ſucceſſor, and the Heraclidæ marched from that part of the country to go to recover Peloponneſus. The Dorians ſent many colonies into different places, which bore the ſame name as their native country. The moſt famous of theſe is in Aſia Minor, of which Halicarnaſſus was once the capital. This part of Aſia Minor was called *Hexapolis*, and afterwards *Pentapolis*.

DORIS, a genus of inſects, belonging to the order of vermes teſtacea. The body is oblong, flat beneath; creeping: mouth placed below: vent behind ſurrounded with a fringe: two feelers, retractile. There are ſeveral ſpecies.—The argo, or lemon doris, has an oval body, convex, marked with numerous punctures, of a lemon colour, the vent beſet with elegant ramifications. It inhabits different parts of our ſeas, called about Brighthelmſtone the *ſea-lemon*. See Plate CLXIV.

DORMANT, in heraldry, is uſed for the poſture of a lion, or any other beaſt, lying along in a ſleeping attitude with the head on the fore-paws; by which it is diſtinguiſhed from the *couchant*, where though the beaſt is lying, yet he holds up his head.

DORMER, in architecture, ſignifies a window made in the roof of an houſe, or above the entablature, being raiſed upon the rafters.

DORMITORY, a gallery in convents or religious houſes, divided into ſeveral cells, in which the religious ſleep or lodge.

DORMOUSE, in zoology. See MUS and SCIURUS.

DORONICUM, LEOPARD'S BANE: A genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is naked, the pappus ſimple; the ſcales of the calyx in a double row, longer than the diſc. The ſeeds of the radius naked without any pappus. There are three ſpecies; of which the only one worthy of notice is the pardalianches, with obtuſe heart-ſhaped leaves. It grows naturally in Hungary, and on the Helvetian mountains; but is frequently preſerved in the Engliſh gardens. It hath thick fleſhy roots, which divide into many knobs or knees, ſending out ſtrong fleſhy fibres which penetrate deep into the ground; from theſe ariſe in the ſpring a cluſter of heart-ſhaped leaves, which are hairy, and ſtand upon footſtalks: between theſe ariſe the flower-ſtalks, which are channelled and hairy, near three feet high, putting out one or two ſmaller ſtalks from the ſide. Each ſtalk is terminated by one large yellow flower. The plant multiplies very faſt by its ſpreading roots; and the ſeeds, if permitted to ſcatter, will produce plants wherever they happen to fall; ſo that it very ſoon becomes a weed in the places where it is once eſtabliſhed. It loves a moiſt ſoil and ſhady ſituation. The roots were formerly uſed in medicine as alexipharmics and purifiers of the blood, but their operation was ſo violent that they are now entirely laid aſide.

DORSAL, an appellation given to whatever belongs to the back. See DORSUM.

DORSET (Thomas Sackville), Lord Buckhurſt. See SACKVILLE.

DORSET (Charles Sackville), Earl of. See SACKVILLE.

DORSETSHIRE, a county of England, bounded on the ſouth by the Engliſh channel, on the north by Somerſetſhire and Wiltſhire, on the eaſt by Hampſhire, and on the weſt by Devonſhire and ſome part of Somerſetſhire. It is between 40 and 50 miles long from eaſt to weſt, and 34 broad from ſouth to north, and contains 34 hundreds, 22 market-towns, and 248 pariſhes. This county enjoys a mild, pleaſant, and wholeſome air, and a deep, rich, and fertile ſoil, finely diverſified. Towards the north it is level, under the high lands that divide it from Somerſetſhire, where there are fine arable grounds that will yield large crops of different kinds of grain. But on the ſouth, from the

the borders of Hampſhire by the ſea-coaſt, for an extent of almoſt 20 miles in length, and in ſome places four or five in breadth, is an heathy common, which renders this country leſs populous than it otherwiſe would be. From eaſt to weſt run a ridge of hills called the *Downs*, abounding with ſweet and ſhort herbage, which nouriſhes a vaſt number of ſheep equally eſteemed for their fleſh and fleece. The country is alſo very plentifully watered; and in all reſpects ſo well ſuited both for pleaſure and profit, that it was diſtinguiſhed by the Romans above all others. They had more ſtations and ſummer-camps in Dorſetſhire than in any other county. That the Saxons had the ſame regard for it, is evident from the number of palaces they had in it, the ſtately minſters they built, and the expreſs directions they gave that their bodies ſhould be interred in thoſe monuments of their piety. This county yields many and very valuable commodities. The quarries in Purbeck and Portland ſupply ſtones of different qualities, ſuited to various uſes, and in prodigious quantities, together with ſome very rich and beautiful marble. The beſt tobacco-pipe clay in England is alſo found in this county. Madder, hemp, and flax, alſo thrive in many places, grain of all ſorts, &c.

DORSIFEROUS PLANTS, among botaniſts, ſuch as are of the capillary kind, without ſtalks, and which bear their ſeeds on the back-ſide of their leaves.

DORSTENIA, CONTRAVERVA: A genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 53d order, *Scabridæ*. The receptacle is common, monophyllous, and carnous; the ſeeds lying ſingly in the carnous ſubſtance. There are four ſpecies, all of them low herbaceous plants, growing in the warm countries of America. The root is uſed in medicine. It is full of knots; an inch or two in length, about half an inch thick; externally of a reddiſh brown colour, and pale within; long, tough, ſlender fibres ſhoot out from all ſides of it, which are generally loaded with ſmall round knots. The root has a peculiar kind of aromatic ſmell, and a ſomewhat aſtringent, warm, bitteriſh taſte, with a light and ſweetiſh kind of acrimony when chewed. The fibres have little taſte or ſmell; the tuberous part therefore ſhould only be choſen.—Contrayerva is one of the mildeſt of thoſe ſubſtances called *alexipharmics*: it is indiſputably a good and uſeful diaphoretic. Its virtues are extracted both by water and rectified ſpirit, and do not ariſe by evaporation with either. The plants cannot be propagated in this country without the greateſt difficulty.

DORSUM, the BACK, in anatomy, comprehends all the poſterior part of the trunk of the body from the neck to the buttocks. See ANATOMY, n° 29, &c.

DORT, or DORDRECHT, a city of Holland, which holds the firſt rank in the aſſembly of the ſtates. It is ſeated in a ſmall iſland formed by the rivers Meuſe, Merue, Rhine, and Linghe. The Meuſe, on which it ſtands, gives it a good harbour, and ſeparates it from the iſlands of Iſſelmonde and Ablas. It is divided from Beyerland by a canal. The harbour is very commodious for the merchandizes which come down the Rhine and the Meuſe, which keep it in a flouriſhing condition. Its ſtrength conſiſts in being ſurrounded with water. Its walls are old, and defended by round towers. It is very rich, and well built with brick, and had formerly the excluſive right of coining money. It is at preſent the ſtaple town for wines, particularly Rheniſh. It was detached from the main land in 1421, on the 17th of November, by a flood occaſioned by the breaking down of the dyke, which overwhelmed 70 villages, and about 100,000 perſons. However, by time and the induſtry of the inhabitants, a great part of the land is recovered. It has two principal canals, namely, the New and Old Haven, by which heavy-loaded veſſels may enter into the city. Over the Old Haven is a large bridge well built with brick.

Dort was almoſt reduced to aſhes in the year 1457; there being then conſumed 2000 houſes, with the halls, hoſpital, and church of Notre Dame: but they are now well provided with fire-engines and watchmen to prevent the like diſaſter. This city is famous for the meeting of the clergy called the *Senate of Dort*, in which the Calviniſts obtained a ſentence againſt the Arminians, who were called the *Remonſtrants*. The diſpute between the contending parties occaſioned ſtrange diſorders, ſkirmiſhes, and murders, in moſt of the principal cities. Thoſe miniſters who would not ſubſcribe to the decree of the ſynod were baniſhed, of whom there were above 100. E. Long. 4. 36. N. Lat. 51. 39.

*Synod of* DORT, a national ſynod, ſummoned by authority of the States General, the provinces of Holland, Utrecht, and Overyſſel excepted, and held at Dort in 1618. The moſt eminent divines of the United Provinces, and deputies from the churches of England, Scotland, Switzerland, Bremen, Heſſia, and the Palatinate, aſſembled on this occaſion in order to decide the controverſy between the Gomariſts or Calviniſts and Arminians; the latter of whom were declared corrupters of the true religion. But the authority of this ſynod was far from being univerſally acknowledged either in Holland or in England. The provinces of Frieſland, Zealand, Utrecht, Guelderland, and Groningen, could not be perſuaded to adopt their deciſions; and they were oppoſed by the authority of Archbiſhop Laud and King James I. in England. The reformed churches in France, though at firſt diſpoſed to give a favourable reception to the deciſions of this famous ſynod, in proceſs of time eſpouſed doctrines very different from thoſe of the Gomariſts; and the churches of Brandenburgh and Bremen would not ſuffer their doctors to be tied down to the opinions and tenets of the Dutch divines. The liberty of private judgment with reſpect to the doctrines of predeſtination and grace, which the ſpirit that prevailed among the divines of Dort ſeemed ſo much adapted to diſcourage and ſuppreſs, acquired new vigour in conſequence of the arbitrary proceedings of this aſſembly.

DORTMUND, a rich, populous, and imperial city of Germany, in the circle of Weſtphalia. It is pretty large, but not well built. Formerly it was one of the Hanſe towns. Its territory alſo was formerly a county, and had lords of its own; but ſince 1504, it hath been poſſeſſed entirely by the city.

DORYPHORI (from δορυ *ſpear*, and φερω *I bear*), an appellation given to the life-guard-men of the Roman emperors. They were held in ſuch high eſtimation, as frequently to have the command of armies conferred on them.—It was uſual alſo for chief commanders to have their doryphori or life-guard to attend them.

**DOSE**, in pharmacy, &c. the quantity of a medicine to be taken at one time. The word is formed from the Greek δοσις, which ſignifies *gift*, or a thing given; from διδωμι *do*, "I give."

**DOSITHEANS**, DOSITHEI, an ancient ſect among the Samaritans in the firſt century of the Chriſtian era.

Mention is made in Origen, Epiphanius, Jerom, and divers other Greek and Latin fathers, of one Doſitheus, the chief of a faction among the Samaritans; but the learned are not at all agreed as to the time wherein he lived. St Jerom, in his dialogue againſt the Luciferians, places him before our Saviour; wherein he is followed by Druſius, who in his anſwer to Serrarius places him about the time of Sennacherib king of Aſſyria. But Scaliger will have him poſterior to our Saviour's time: And in effect Origen intimates him to have been contemporary with the apoſtles; where he obſerves, that he endeavoured to perſuade the Samaritans that he was the Meſſiah foretold by Moſes.

He had many followers; and his ſect was ſtill ſubſiſting at Alexandria in the time of the patriarch Eulogius, as appears from a decree of that patriarch publiſhed by Photius. In that decree, Eulogius accuſes Doſitheus of injuriouſly treating the ancient patriarchs and prophets, and attributing to himſelf the ſpirit of prophecy. He makes him contemporary with Simon Magus; and accuſes him of corrupting the Pentateuch in divers places, and of compoſing ſeveral books directly contrary to the law of God.

Archbiſhop Uſher takes Doſitheus to be the author of all the changes made in the Samaritan Pentateuch, which he argues from the authority of Eulogius. But all we can juſtly gather from the teſtimony of Eulogius is, that Doſitheus corrupted the Samaritans copies ſince uſed by that ſect; but that corruption did not paſs into all the copies of the Samaritan Pentateuch now in uſe among us, which vary but little from the Jewiſh Pentateuch: And in this ſenſe we are to underſtand that paſſage in a Samaritan chronicle, where it is ſaid that Douſis, *i.e.* Doſitheus, altered ſeveral things in the law of Moſes. The author of that chronicle, who was a Samaritan by religion, adds, that their high-prieſt ſent ſeveral Samaritans to ſeize Douſis and his corrupted copy of the Pentateuch.

Epiphanius takes Doſitheus to have been a Jew by birth, and to have abandoned the Jewiſh party for that of the Samaritans. He imagines him likewiſe to have been the author of the ſect of the Sadducees: Which ſeems inconſiſtent with his being later than our Saviour; and yet the Jeſuit Serrarius agrees to make Doſitheus the maſter of Sadoc, from whom the Sadducees are derived.

Tertullian, making mention of the ſame Doſitheus, obſerves, that he was the firſt who dared to reject the authority of the prophets by denying their inſpiration. But he charges that as a crime peculiar to this ſectary, which in reality is common to the whole ſect, who have never allowed any but the five books of Moſes for divine.

**DOSSER**, a ſort of baſket to be carried on the ſhoulders of men. It is uſed in carrying the overplus earth from one part of a fortification to another where it is wanted. There are likewiſe ſmall carts and wheel-barrows for the ſame uſe.

**DOSSIL**, in ſurgery, is lint made into a cylindric form, or reſembling the ſhape of dates or olive-ſtones. Doſſils are ſometimes ſecured by a thread tied round their middle.

**DOTTEREL**, in ornithology. See CHARADRIUS.

**DOU**, or DOUW, (Gerard). See DOUW.

**DOUAY**, or DOWAY, a large and ſtrong city of the French Netherlands, ſituated in E. Long. 3. 0. N. Lat. 50. 25. It is ſituated on the river Scarpe, in a very fertile and pleaſant country. The town is large and populous, and exceedingly well fortified. You enter it by ſix gates, and the ſtreets from each of theſe gates lead to the market-place. Here is a venerable old town-houſe, adorned with the ſtatues of the earls of Flanders, in which the magiſtrates aſſemble, and are renewed every thirteen months. Here alſo are held ſeveral country courts for the dependencies of Douay, which contain about 30 villages. The parliament of Douay was at firſt only a ſupreme council, eſtabliſhed at Tournay in 1668, and erected into a parliament in 1686. But Tournay being taken by the allies in 1709, the parliament was removed to Cambray; and upon the yielding of Tournay to the Auſtrians by the treaty of Utrecht, the parliament was removed to Douay, where it ſtill continues. This city was erected into an univerſity like that of Louvain by Philip II. becauſe of its being in the middle of ſo many great cities, and Louvain at ſo great a diſtance, that the children on that ſide of the country were generally ſent for their education into France. It contains 14 colleges, all governed and ſettled after the manner of thoſe at Louvain; and the ſchools of philoſophy, canon and civil law, and phyſic, are diſpoſed alſo after the ſame manner, only the rector here is choſen annually. There is a conſiderable ſeminary here of Engliſh Roman Catholics, founded by Philip II. of Spain about the year 1569. There is alſo a great number of convents; and among the reſt two Engliſh, one of Franciſcan friars, the other of Benedictine monks. Douay was taken from the Spaniards by the French king in perſon in 1667, after a ſhort reſiſtance. That prince made it very ſtrong, and built a fort about a cannon ſhot below it upon the Scarp, with ſluices, by which the adjacent country could be drowned. The allies laid ſiege to it in 1710, under the command of the Duke of Marlborough; and after a vigorous defence, the town and Fort Scarp ſurrendered upon honourable terms. It was retaken by the French in 1712, after the ſuſpenſion of arms between Great Britain and France.

**DOUBLE**; two of a ſort, one correſponding to the other.

DOUBLE *Children*, *Double Cats*, *Double Pears*, &c. Inſtances of theſe are frequent in the *Philoſoph. Tranſact.* and elſewhere. See MONSTER.

Sir John Floyer, in the ſame *Tranſactions*, giving an account of a *double turkey*, furniſhes ſome reflections on the production of *double animals* in general. Two turkeys, he relates, were taken out of an egg of the common ſize, when the reſt were well hatched, which grew together by the fleſh of the breaſt-bone, but in all other parts were diſtinct. They ſeemed leſs than the ordinary ſize, as wanting bulk, nutriment, and room for their growth; which latter, too, was apparently the occaſion of their coheſion. For, having two diſtinct cavities in their bodies, and two hearts, they muſt have ariſen from two cicatriculas; and, conſequently,

quently, the egg had two yolks; which is no uncommon accident. He mentions a dried *double chicken* in his poſſeſſion, which, though it had four legs, four wings, &c. had but one cavity in the body, one heart, and one head; and, conſequently, was produced from one cicatricula.

So, Paræus mentions a *double infant*, with only one heart: in which caſe, the original or ſtamen of the infant was one, and the veſſels regular; only, the nerves and arteries towards the extremities dividing into more branches than ordinary, produced *double* parts.

The ſame is the caſe in the *double flowers* of plants, occaſioned by the richneſs of the ſoil. So it is in the eggs of quadrupeds, &c.

There are, therefore, two reaſons of duplicity in embryos: 1. The conjoining or connection of two perfect animals; and, 2. An extraordinary diviſion and ramification of the original veſſels, nerves, arteries, &c.

*Double Employment*, in muſic, a name given by M. Rameau to the two different manners in which the chord of the ſub-dominant may be regarded and treated, viz. as the fundamental chord of the ſixth ſuperadded, or as the chord of the great ſixth, inverted from a fundamental chord of the ſeventh. In reality, the chords carry exactly the ſame notes, are figured in the ſame manner, are employed upon the ſame chord of the tone, in ſuch a manner, that frequently we cannot diſcern which of the two chords the author employs, but by the aſſiſtance of the ſubſequent chord, which reſolves it, and which is different in theſe different caſes.

To make this diſtinction, we muſt conſider the diatonic progreſs of the two notes which form the fifth and the ſixth, and which, conſtituting between them the interval of a ſecond, muſt one or the other conſtitute the diſſonance of the chord. Now, this progreſs is determined by the motion of the baſs. Of theſe two notes, then, if the ſuperior be the diſſonance, it will riſe by one gradation into the ſubſequent chord, the lower note will keep its place, and the higher note will be a ſuperadded ſixth. If the lower be the diſſonance, it will deſcend into the ſubſequent chord, the higher will remain in its place, and the chord will be that of the great ſixth. See the two caſes of the *double employment* in Rouſſeau's Muſical Dictionary, Plate D, fig. 12.

With reſpect to the compoſer, the uſe which he may make of the double-employment, is to conſider the chord in its different points of view, that from thence he may know how to make his entrance to it, and his exit from it; ſo that having arrived, for inſtance, at the chord of the ſuperadded ſixth, he may reſolve it as a chord of the great ſixth, and reciprocally.

M. D'Alembert has ſhown, that one of the chief uſes of the double-employment is, that we be able to carry the diatonic ſucceſſion of the gamut even to an octave, without changing the mode, at leaſt whilſt we riſe; for in deſcending we muſt change it. Of this gamut and its fundamental baſs, an example will be found in Rouſſeau's Muſical Dictionary, Plate D, fig. 13. It is evident, according to the ſyſtem of M. Rameau, that all the harmonic ſucceſſions which reſult from it, are in the ſame tone: for, in ſtrictneſs, no other chords are there employed but three, that of the tonic, that of the dominant, and that of the ſub-dominant; as this laſt, in the double-employment, conſtitutes the ſeventh from the ſecond note, which is employed upon the ſixth.

With reſpect to what M. D'Alembert adds in his Elements of Muſic, p. 80. and which he repeats in the Encyclopédie, article *Double-emploi*, viz. that the chord of the ſeventh *re fa la ut*, though we ſhould even regard it only as an inverſion of *fa la ut re*, cannot be followed by the chord *ut mi ſol ut*; "I cannot (ſays Rouſſeau) be of his opinion in this point.

"The proof which he gives for it is, that the diſſonance *ut* of the firſt chord cannot be reſolved in the ſecond; and this is true, ſince it remains in its place: but in this chord of the ſeventh *re fa la ut*, inverted from this chord of the ſuperadded ſixth *fa la ut re*, it is not the *ut*, but the *re*, which is the diſſonance; which, of conſequence, ought to be reſolved in aſcending upon *mi*, as it really does in the ſubſequent chord; ſo that this procedure in the baſs itſelf is forced, which, from *re*, cannot without an error return to *ut*, but ought to aſcend to *mi*, in order to reſolve the diſſonance.

"M. D'Alembert afterwards ſhows, that this chord *re fa la ut*, when preceded and followed by that of the tonic, cannot be authoriſed by the double-employment: and this is likewiſe very true; becauſe this chord, tho' figured with a 7, is not treated as a chord of the ſeventh, neither when we make our entrance to it, nor our exit from it; or at leaſt that it is not neceſſary to treat it as ſuch, but ſimply as an inverſion of the ſuperadded ſixth, of which the diſſonance is the baſs: in which caſe we ought by no means to forget, that this diſſonance is never prepared. Thus, though in ſuch a tranſition the double-employment is not in queſtion, though the chord of the ſeventh be no more than apparent, and impoſſible to be reſolved by the rules, this does not hinder the tranſition from being proper and regular, as I have juſt proved to theoriſts, I ſhall immediately prove to practical artiſts, by an inſtance of this tranſition; which certainly will not be condemned by any one of them, nor juſtified by any other fundamental baſs except my own. (See the Muſical Dictionary, Plate D, fig. 14.)

"I acknowledge, that this inverſion of the chord of the ſixth ſuperadded, which transfers the diſſonance to the baſs, has been cenſured by M. Rameau. This author, taking for a fundamental chord the chord of the ſeventh, which reſults from it, rather choſe to make the fundamental baſs deſcend diatonically, and reſolve one ſeventh by another, than to unfold this ſeventh by an inverſion. I had diſſipated this error, and many others, in ſome papers which long ago had paſſed into the hands of M. D'Alembert, when he was compoſing his Elements of Muſic; ſo that it is not his ſentiment which I attack, but my own opinion which I defend."

For what remains, the double-employment cannot be uſed with too much reſerve, and the greateſt maſters are the moſt temperate in putting it in practice.

*Double Fichy*, or *Fiché*, in heraldry, the denomination of a croſs, when the extremity has two points; in contradiſtinction to fiché, where the extremity is ſharpened away to one point.

*Double Octave*, in muſic, an interval compoſed of fifteen notes in diatonic progreſſion; and which, for that reaſon, is called a *fifteenth*. "It is (ſays Rouſſeau) an interval compoſed of two octaves, called by the Greeks *diſdiapaſon*."

It deſerves, however, to be remarked, that in intervals leſs diſtant and compounded, as in the *third*, the *fifth*, the

the *ſimple octave*, &c. the loweſt and higheſt extremes are included in the number from whence the interval takes its name. But, in the *double octave*, when termed a fifteenth, the ſimple number of which it is compoſed gives the name. This is by no means analogical, and may occaſion ſome confuſion. We ſhould rather chooſe, therefore, to run any hazard which might occur from uniformly including all the terms of which the component intervals conſiſt, and call the *double* octave a ſixteenth, according to the general analogy. See INTERVAL

DOUBLET, among lapidaries, implies a counterfeit ſtone compoſed of two pieces of cryſtal, and ſometimes glaſs ſoftened, together with proper colours between them; ſo that they make the ſame appearance to the eye as if the whole ſubſtance of the cryſtal had been tinged with theſe colours.

The impracticability of imparting tinges to the body of cryſtals, while in their proper and natural ſtate, and the ſoftneſs of glaſs, which renders ornaments made of it greatly inferior in wear to cryſtal, gave inducements to the introduction of colouring the ſurface of cryſtal wrought in a proper form, in ſuch a manner, that the ſurfaces of two pieces ſo coloured being laid together, the effect might appear the ſame as if the whole ſubſtance of the cryſtal had been coloured. The cryſtals, and ſometimes white tranſparent glaſs ſo treated, were called *doublets;* and at one time prevailed greatly in uſe on account of the advantages, with reſpect to wear, ſuch doublets had, when made of cryſtal, over glaſs, and the brightneſs of the colours which could with certainty be given to counterfeit ſtones this way, when coloured glaſs could not be procured, or at leaſt not without a much greater expence. Doublets have not indeed the property which the others have, of bearing to be ſet tranſparent, as is frequently required in drops of ear-rings and other ornaments: but when mounted in rings, or uſed in ſuch manner that the ſides of the pieces, where the joint is made, cannot be inſpected, they have, when formed of cryſtal, the title to a preference to the coloured glaſs; and the art of managing them is therefore, in ſome degree, of the ſame importance with that of preparing glaſs for the counterfeiting gems; and is therefore properly an appendage to it, as being entirely ſubſervient to the ſame intention. The manner of making doublets is as follows:

Let the cryſtal or glaſs be firſt cut by the lapidaries in the manner of a brilliant, except that, in this caſe, the figure muſt be compoſed from two ſeparate ſtones, or parts of ſtones, formed in the manner of the upper and under parts of a brilliant if it was divided in an horizontal direction, a little lower than the middle. After the two plates of the intended ſtone are thus cut, and fitted ſo exactly that no diviſion can appear when they are laid together, the upper part muſt be poliſhed ready for ſetting; and then the colour muſt be put betwixt the two plates by this method. "Take of Venice or Cyprus turpentine two ſcruples; and add to it one ſcruple of the grains of maſtich choſen perfectly pure, free from foulneſs, and previouſly powdered. Melt them together in a ſmall ſilver or braſs ſpoon ladle, or other veſſel, and put to them gradually any of the coloured ſubſtances below mentioned, being firſt well powdered; ſtirring them together as the colour is put in, that they may be thoroughly commixed. Warm then the doublets to the ſame degree of heat as the melted mixture; and paint the upper ſurface of the lower part, and put the upper one inſtantly upon it, preſſing them to each other, but taking care that they may be conjoined in the moſt perfectly even manner. When the cement or paint is quite cold and ſet, the redundant part of it, which has been preſſed out of the joint of the two pieces, ſhould be gently ſcraped off the ſide, till there be no appearance of any colour on the outſide of the doublets: and they ſhould then be ſkilfully ſet; obſerving to carry the mounting over the joint, that the upper piece may be well ſecured from ſeparating from the under one."

The colour of the ruby may be beſt imitated, by mixing a fourth part of carmine with ſome of the fineſt crimſon lake that can be procured.

The ſapphire may be counterfeited by very bright Pruſſian blue, mixed with a little of the above mentioned crimſon lake, to give it a caſt of the purple. The Pruſſian blue ſhould not be very deep-coloured, or but little of it ſhould be uſed: for otherwiſe, it will give a black ſhade that will be injurious to the luſtre of the doublets.

The emerald may be well counterfeited by diſtilled verdigreaſe, with a little powdered aloes. But the mixture ſhould not be ſtrongly heated, nor kept long over the fire after the verdigreaſe is added: for the colour is to be ſoon impaired by it.

The reſemblance of the garnet may be made by dragon's blood; which, if it cannot be procured of ſufficient brightneſs, may be helped by a very ſmall quantity of carmine.

The amethyſt may be imitated by the mixture of ſome Pruſſian blue with the crimſon lake; but the proportions can only be regulated by direction, as different parcels of the lake and Pruſſian blue vary extremely in the degree of ſtrength of the colour.

The yellow topazes may be counterfeited by mixing the powdered aloes with a little dragon's blood, or by good Spaniſh anotto: but the colour muſt be very ſparingly uſed, or the tinge will be too ſtrong for the appearance of that ſtone.

The chryſolite, hyacinth, vinegar garnet, eagle marine, and other ſuch weaker or more diluted colours, may be formed in the ſame manner, by leſſening the proportions of the colours, or by compounding them together correſpondently to the hue of the ſtone to be imitated; to which end it is proper to have an original ſtone, or an exact imitation of one, at hand when the mixture is made, in order to the more certain adapting the colours to the effect deſired: and when theſe precautions are taken, and the operation well conducted, it is practicable to bring the doublets to ſo near a reſemblance of the true ſtones, that even the beſt judges cannot diſtinguiſh them, when well ſet, without a peculiar manner of inſpection.

There is, however, an eaſy method of diſtinguiſhing doublets, which is only to behold them betwixt the eye and light, in ſuch poſition, that the light may paſs through the upper part and corners of the ſtone: when it will eaſily be perceived that there is no colour in the body of the ſtone.

DOUBLETS, a game on dice within tables; the men, which are only 15, being placed thus: Upon the ſice, cinque, and quatre points, there ſtand three men a-piece; and upon the trey, duce, and ace, only two. He that throws higheſt hath the benefit of throwing firſt, and what he throws he lays down, and ſo doth the other: what the one throws, and hath not, the other lays down for him, but on his own account; and thus they do till all the men are down, and then they bear. He that is down firſt, bears firſt; and will doubtleſs win the game, if the other throws not doublets to overtake him: which he is ſure to do, ſince he advances or bears as many as the doublets make, viz. eight for two fours.

DOUBLING, in the military art, is the putting two ranks or files of ſoldiers into one. Thus, when the word of command is, *double your ranks*, the ſecond, fourth, and ſixth ranks march into the firſt, third, and fifth, ſo that the ſix ranks are reduced to three, and the intervals between the ranks become double what they were before.

Doubling, among hunters, who ſay that a hare doubles, when ſhe keeps in plain fields, and winds about to deceive the hounds.

Doubling, in the manege, a term uſed of a horſe, who is ſaid to double his reins, when he leaps ſeveral times together, to throw his rider: thus we ſay, *the ramingue doubles his reins, and makes pontlevis.*

Doubling, in navigation, the act of ſailing round, or paſſing beyond, a cape or promontory, ſo as that the cape or point of land ſeparates the ſhip from her former ſituation, or lies between her and any diſtant obſerver.

*Doubling-Upon*, in naval tactics, the act of incloſing any part of a hoſtile fleet between two fires, or of cannonading it on both ſides.

It is uſually performed by the van or rear of that fleet which is ſuperior in number, taking the advantage of the wind, or of its ſituation and circumſtances, and tacking or veering round the van or rear of the enemy, who will thereby be expoſed to great danger, and can ſcarcely avoid being thrown into a general confuſion.

DOUBLON, or Dubloon, a Spaniſh and Portugueſe coin, being the double of a Pistole.

DOUBTING, the act of with-holding our aſſent from any propoſition, on ſuſpicion that we are not thoroughly appriſed of the merits thereof, or from not being able peremptorily to decide between the reaſons for and againſt it.

Doubting is diſtinguiſhed by the ſchoolmen into two kinds, *dubitatio ſterilis*, and *dubitatio efficax*. The former is that where no determination enſues: in this manner the Sceptics and Academics doubt, who withhold their aſſent from every thing. See Sceptics, &c.

The latter is followed by judgment, which diſtinguiſhes truth from falſehood: ſuch is the doubting of the Peripatetics and Carteſians. The laſt in particular are perpetually inculcating the deceitfulneſs of our ſenſes, and tell us that we are to doubt of every one of their reports, till they have been examined and confirmed by reaſon. On the other hand, the Epicureans teach, that our ſenſes always tell truth; and that, if you go ever ſo little from them, you come within the province of doubting. See Cartesians, Epicureans, &c.

Doubting, in rhetoric, a figure whereon the orator appears ſome time fluctuating, and undetermined what to do or ſay. Tacitus furniſhes us with an inſtance of doubting, almoſt to a degree of diſtraction, in thoſe words of Tiberius written to the ſenate: *Quid ſcribam, P. S. aut quomodo ſcribam, aut quid omnino non ſcribam hoc tempore, dii me deæque pejus perdant quam perire quotidie ſentio, ſi ſcio.*

DOUCETS, or Doulcets, among ſportſmen, denote the teſtes of a deer or ſtag.

DOUCINE, in architecture, a moulding concave above and convex below, ſerving commonly as a cymatium to a delicate corniche. It is likewiſe called gula.

DOVE, in ornithology. See Columba.

*Dove-Tailing*, in carpentry, is the manner of faſtening boards together by letting one piece into another, in the form of the tail of a dove. The dove-tail is the ſtrongeſt of the aſſemblages or jointings; becauſe the tenon, or piece of wood which is put into the other, goes widening to the extreme, ſo that it cannot be drawn out again, by reaſon the extreme or tip is bigger than the hole.

DOVER, a borough and port town of England, in the county of Kent, ſituated in E. Long. 0. 25. N. Lat 51. 10. It ſends two members to parliament, ſtyled *barons of the Cinque-ports*, whereof Dover is the chief. Dover gave the title of duke in the Queenſberry family, but extinct: now a revived barony in the York family.

By the Romans this town was named *Dubris*, and by the Saxons *Doſra*, probably from the Britiſh word *Dour*, which ſignifies water. The convenience of its ſituation drew the attention of the Roman governors, who ruled here while they poſſeſſed this part of the iſland; and there ſtill remain indubitable teſtimonies of their care and reſpect for this important place. For the defence of the town, the Romans, or, according to ſome, Arviragus, a Britiſh king, their confederate, by cutting out walls with infinite labour in the ſolid rock, conſtructed a ſtony fortreſs; and, as its venerable remains ſtill prove, erected alſo a light-houſe for the benefit of navigation. The Saxons, Danes, and Normans, had a very high opinion of this place; and when the barons invited over the young prince, afterwards Louis VIII. of France, his father Philip Auguſtus conceived a bad opinion of the expedition, becauſe the caſtle and port of Dover were held for king John, though a great part of the kingdom had ſubmitted to Louis. In its moſt flouriſhing ſtate, the fortreſs was impregnable, and the town a very opulent emporium. It had 21 wards, each of which furniſhed a ſhip for the public ſervice, 10 gates, 7 pariſh-churches, many religious houſes, hoſpitals, and other public edifices. The decay of the town was brought on by that of the harbour. To recover this, Henry VIII. ſpent no leſs than 63,000l. in conſtructing piers, and 5000l. in building a caſtle between this and Folkſtone, called *Sandgate*; where the ſhore was flat, and the landing eaſy. Notwithſtanding all this expence, however, it was again choaked up in the reign of queen Elizabeth, by whom it was again cleared at a vaſt expence, ſo that ſhips of ſome hundred tons could enter it. Since that time it has again declined, notwithſtanding of many efforts for its relief, and great aſſiſtance from time to time given by parliament for this purpoſe. As the haven, however, is is ſtill capable of receiving veſſels of ſmall burden; and as the packets to France and Flanders are ſtationed here in time of peace, it is ſtill a place of ſome conſequence, and the people are active and induſtrious.

*Dover Straits*, the narrow channel between Dover and Calais, which ſeparates our iſland from the oppoſite continent. Britain is ſuppoſed by many to have been once peninſulated, the preſent ſtraits occupying the ſite of the iſthmus which joined it to Gaul. "No certain cauſe (ſays Mr Pennant*) can be given for the mighty convulſion which tore us from this continent; whether it was rent by an earthquake, or whether it was worn through by the continual daſhing of the waters, no Pythagoras is left to ſolve the *Fortuna locorum:*

> *Vidi ego, quod fuerat quondam ſoliſſima tellus*
> *Eſſe fretum.*

But it is moſt probable, that the great philoſopher alluded to the partial deſtruction of the *Atlantica inſula*, mentioned by Plato as a diſtant tradition in his days. It was effected by an earthquake and a deluge, which might have rent aſunder the narrow iſthmus in queſtion, and left Britain, large as it ſeems at preſent, the mere wreck of its original ſize. The Scilly iſles, the Hebrides, Orkneys, Schetlands, and perhaps the Feroe iſlands, may poſſibly be no more than fragments of the once far-extended region. I have no quarrel about the word *iſland*. The little iſthmus, compared to the whole, might have been a junction never attended to in the limited navigations of very early times. The peninſula had never been wholly explored, and it paſſed with the ancients for a genuine iſland. The correſpondency of ſtrata on part of the oppoſite ſhores of Britain and France, leaves no room to doubt but that they were once united. The chalky cliffs of Blancnez between Calais and Bologne, and thoſe to the weſtward of Dover, exactly tally: the laſt are vaſt and continued; the former ſhort, and the termination of the immenſe bed. Between Bologne and Folkſtone (about ſix miles from the latter) is another memorial of the junction of the two countries; a narrow ſubmarine hill, called the *Rip-raps*, about a quarter of a mile broad, and ten miles long, extending eaſtwards towards the Goodwin Sands. Its materials are boulderſtones, adventitious to many ſtrata. The depth of water on it, in very low ſpring-tides, is only fourteen feet. The fiſhermen from Folkſtone have often touched it with a fifteen feet oar; ſo that it is juſtly the dread of navigators. Many a tall ſhip has periſhed on it, and ſunk inſtantly into twenty-one fathoms water. In July 1782, the Belleiſle of ſixty-four guns ſtruck, and lay on it during three hours; but, by ſtarting her beer and water, got clear off."

* *rct. Zool.* l. I. rod. ii.

Theſe celebrated ſtraits are only twenty-one miles wide in the narroweſt part. From the pier at Dover to that at Calais is twenty-four. It is conjectured, that their breadth leſſens, and that they are two miles narrower than they were in ancient times. An accurate obſerver of fifty years remarks to me, that the increaſed height of water, from a decreaſe of breadth, has been apparent even in that ſpace. The depth of the channel at a medium in higheſt ſpring-tides is about twenty-five fathoms. The bottom either coarſe ſand or rugged ſcars, which have for ages unknown reſiſted the attrition of the currents. From the ſtraits both eaſtward and weſtward is a gradual increaſe of depth through the channel to a hundred fathoms, till ſoundings are totally loſt or unattended to. The ſpring-tides in the ſtraits riſe on an average twenty-four feet, the neap-tides fifteen. The tide flows from the German ſea, paſſes the ſtraits, and meets, with a great rippling, the weſtern tide from the ocean between Fairleigh near Haſtings and Bologne; a proof that, if the ſeparation of the land was effected by the ſeas, it muſt have been by the overpowering weight of thoſe of the north.

Dover, a town of Delaware in North America. It is the chief town of the county of Kent in the Delaware ſtate, and is the ſeat of government. It ſtands on Jones's creek, a few miles from the Delaware river, and conſiſts of about 100 houſes, principally of brick. Four ſtreets interſect each other at right angles, in the centre of the town, whoſe incidencies form a ſpacious parade, on the eaſt ſide of which is an elegant ſtatehouſe of brick. The town has a lively appearance, and drives on a conſiderable trade with Philadelphia. Wheat is the principal article of export. The landing is five or ſix miles from the town of Dover.

DOUGLAS (Lord). See *(Hiſtory of)* Scotland.

Douglas (Gavin), biſhop of Dunkeld in Scotland, was the third ſon of Archibald earl of Angus, and born in the year 1474. Where he was educated, is not known; but it is certain that he ſtudied theology: a ſtudy, however, which did not eſtrange him from the muſes; for he employed himſelf at intervals in tranſlating into beautiful verſe the poem of Ovid *de Remedio Amoris*. The advantages of foreign travel, and the converſation of the moſt learned men in France and Germany, to whom his merit procured the readieſt acceſs, completed his education. With his ſuperior recommendations and worth it was impoſſible he could remain unnoticed. His firſt preferment was to be provoſt of the collegiate church of St Giles in Edinburgh; a place at that time of great dignity and revenue. In the year 1514, the queen mother, then regent of Scotland, appointed Douglas abbot of Aberbrothock, and ſoon after archbiſhop of St Andrew's; but the queen's power not being ſufficient to eſtabliſh him in the poſſeſſion of that dignity, he relinquiſhed his claim in favour of his competitor Foreman, who was ſupported by the pope. In 1515, he was by the queen appointed biſhop of Dunkeld; and that appointment was ſoon after confirmed by his holineſs Leo X. Nevertheleſs it was ſome time before he could obtain peaceable poſſeſſion of his ſee. The duke of Albany, who in this year was declared regent, oppoſed him becauſe he was ſupported by the queen; and, in order to deprive him of his biſhopric, accuſed him of acting contrary to law in receiving bulls from Rome. On this accuſation he was committed to the caſtle of Edinburgh, where he continued in confinement above a year; but the regent and the queen being at laſt reconciled, he obtained his liberty, and was conſecrated biſhop of Dunkeld. In 1517, he attended the duke of Albany to France; but returned ſoon after to Scotland. In 1521, the diſputes between the earls of Arran and Angus having thrown the kingdom into violent commotion, our prelate retired to England, where he became intimately acquainted with Polydore Virgil the hiſtorian. He died in London of the plague in 1522; and was buried in the Savoy. He wrote, 1. The Palace of Honour: a moſt ingenious poem under the ſimilitude of a viſion; in which he paints the vanity and inconſtancy of all worldly glory. It abounds with incidents, and a very rich vein of poetry. The palace of happineſs, in the picture of Cebes, ſeems to be the ground-work of it. 2. *Aureæ Narrationes:* a performance now loſt; in which, it is ſaid, he explained, in a moſt agreeable manner, the mythology of the poetical fictions of the ancients. 3. *Comœdiæ aliquot ſacræ:* None of which are now to be found. 4. Thirteen Bukes of Eneades, of the famoſe poet Virgil, tranſlatet out of Latin verſes into Scottiſh metre, every buke having its particular prologe. Imprinted at London 1553, in 4to; and reprinted at Edinburgh 1710, in folio. The laſt is the moſt eſteemed of all his works. He undertook it at the deſire of lord Henry Sinclair, a munificent patron of arts in thoſe times: and he completed it in 18 months; a circumſtance which his admirers are too fond of repeating to his advantage. David Hume of Godſcroft, an author of uncommon merit, and an admirable judge of poetry, gives the following teſtimony in his favour. "He wrote (ſays he) in his native tongue divers things; but his chiefeſt work is his tranſlation of Virgil, yet extant, in verſe: in which he ties himſelf ſo ſtrictly as is poſſible; and yet it is ſo well expreſſed, that whoſoever will eſſay to do the like, will find it a hard piece of work to go through with it. In his prologues before every book, where he hath his liberty, he ſhoweth a natural and ample vein of poetry, ſo pure, pleaſant, and judicious, that I believe there is none that hath written before or ſince but cometh ſhort of him." It has been ſaid, that he compiled an hiſtorical treatiſe *De rebus Scoticis;* but no remain of it hath deſcended to the preſent times.

**Douglas**, the principal town of the Iſle of Man, and which has lately increaſed both in trade and buildings. The harbour, for ſhips of a tolerable burden, is the ſafeſt in the iſland, and is much mended by a fine mole that has been built. It is ſeated on the eaſtern ſide. W. Long. 4. 25. N. Lat. 54. 7.

**DOUW** (Gerhard), a celebrated painter, was born at Leyden in 1613; and received his firſt inſtructions in drawing and deſign from Bartholomew Dolendo an engraver, and alſo from Peter Kouwhoorn a painter on glaſs; but at the age of fifteen he became a diſciple of Rembrandt. In that famous ſchool he continued for three years; and then found himſelf qualified to ſtudy nature, the moſt unerring director.

From Rembrandt he learned the true principles of colouring, and obtained a complete knowledge of the chiaro-ſcuro; but to that knowledge he added a delicacy of pencil, and a patience in working up his colours to the higheſt degree of neatneſs, ſuperior to any other maſter. He therefore was more pleaſed with thoſe pictures of Rembrandt which were painted in his youth than thoſe by which he was diſtinguiſhed in his more advanced age; becauſe the firſt ſeemed finiſhed with more care and attention, the latter with more boldneſs, freedom, and negligence, which was quite oppoſite to the taſte of Douw. But although his manner appears ſo different from that of his maſter, yet it was to Rembrandt alone that he owed all that excellence in colouring by which he triumphed over all the artiſts of his own country.

His pictures uſually are of a ſmall ſize, with figures ſo exquiſitely touched, ſo tranſparent, ſo wonderfully delicate, as to excite aſtoniſhment as well as pleaſure. He deſigned every object after nature, and with an exactneſs ſo ſingular, that each object appears as perfect as nature itſelf, in reſpect to colour, freſhneſs, and force. His general manner of painting portraits was by the aid of a concave mirror, and ſometimes by looking at the object through a frame with many exact ſquares of fine ſilk. But the latter cuſtom is diſuſed, as the eye of a good artiſt ſeems a more competent rule, though the uſe of the former is ſtill practiſed by painters in miniature.

It is almoſt incredible what vaſt ſums have been given and are given at this day for the pictures of Douw, even in his own country; as alſo in Italy and every polite part of Europe: for he was exceedingly curious in finiſhing them, and patiently aſſiduous beyond example. Of that patience Sandrart gives a ſtrong proof in a circumſtance which he mentions relative to this artiſt. He ſays, that having once, in company with Bamboccio, viſited Gerhard Douw, they could not forbear to admire the prodigious neatneſs of a picture which he was then painting, in which they took particular notice of a broom; and expreſſing their ſurpriſe at the exceſſive neatneſs of the finiſhing that minute object, Douw told them he ſhould ſpend three days more in working on that broom before he ſhould account it entirely complete. In a family picture of Mrs Spiering, the ſame author ſays, that the lady had ſat five days for the finiſhing one of her hands that leaned on an arm-chair. For that reaſon not many would ſit to him for their portraits; and he therefore indulged himſelf moſtly in works of fancy, in which he could introduce objects of ſtill life, and employ as much time on them as ſuited his own inclination. Houbraken teſtifies, that his great patron Mr Spiering allowed him a thouſand guilders a-year, and paid beſide whatever he demanded for his pictures, and purchaſed ſome of them for their weight in ſilver; but Sandrart, with more probability, aſſures us, that the thouſand guilders a-year were paid to Gerhard, on no other conſideration than that the artiſt ſhould give his benefactor the option of every picture he painted, for which he was immediately to receive the utmoſt of his demand. This great maſter died in 1674, aged 61.

Douw appears inconteſtably to be the moſt wonderful in his finiſhing of all the Flemiſh maſters. Every thing that came from his pencil is precious, and his colouring hath exactly the true and the lovely tints of nature; nor do his colours appear tortured, nor is their vigour leſſened by his patient pencil; for whatever pains he may have taken, there is no look of labour or ſtiffneſs; and his pictures are remarkable, not only for retaining their original luſtre, but for having the ſame beautiful effect at a proper diſtance as they have when brought to the neareſt view.

At Turin are ſeveral pictures by Gerhard Douw, wonderfully beautiful; eſpecially one, of a Doctor attending a ſick woman, and ſurveying an urinal. The execution of that painting is aſtoniſhingly fine, and although the ſhadows appear a little too dark, the whole has an inexpreſſible effect. In the gallery at Florence there is a night-piece by candle-light, which is exquiſitely finiſhed; and in the ſame apartment, a mountebank attended by a number of figures, which it ſeems impoſſible either ſufficiently to commend or to deſcribe.

DOULEIA, Δουλεια, among the Athenians, a kind of puniſhment, by which the criminal was reduced into the condition of a ſlave. It was never inflicted upon any but the ατιμοι, *ſojourners* and *freed ſervants*.

*To* DOUSE, in ſea language, is to lower ſuddenly, or ſlacken; and it is applied to a ſail in a ſquall of wind, an extended hawſer, &c.

DOWAGER, Dotissa (*q. d.* a widow endowed, or that has a jointure), a title, or addition, applied to the widows of princes, dukes, earls, and perſons of high rank only.

*Queen* Dowager, is the widow of the king, and as ſuch enjoys moſt of the privileges belonging to her as queen conſort: but it is not high treaſon to violate her chaſtity or conſpire her death, becauſe the ſucceſſion is not endangered thereby; but no man can marry her without ſpecial licenſe from the king, on pain of forfeiting his lands and goods. See Queen.

DOWER, (*Dotarium, Doarium,* or *Dos,*) a portion of lands or tenements which a widow enjoys for term of life from her huſband, in caſe ſhe ſurvives him: and which, at her death, deſcends to their children. But ſhe muſt have been the wife of the party at the time of his deceaſe; or not divorced *a vinculo matrimonii:* nor, if ſhe has eloped from her huſband, and lives with an adulterer, ſhall ſhe be intitled to dower, unleſs her huſband be voluntarily reconciled to her. The widows of traitors are alſo barred of their dower by 5 and 6 Ed. VI. cap. 11. but not the widows of felons. An alien cannot be endowed, unleſs ſhe be queen-conſort. And if a woman levies a fine with her huſband, or if a common recovery be had with the huſband and wife of the huſband's lands, ſhe is barred of her dower. A widow, clear of theſe impediments, is by law intitled to be endowed of all lands and tenements, of which her huſband was ſeiſed in fee-ſimple or fee-tail at any time during the coverture; and of which any iſſue ſhe might have had might by poſſibility have been heir. See Jointure.

DOWN, a county of Ireland in the province of Ulſter, bounded on the eaſt and ſouth by St George's channel; on the weſt by the county of Armagh; and on the north by the county of Antrim. It lies oppoſite to the Iſle of Man, Cumberland, and Weſtmoreland; and the north part of it fronts the Mull of Galloway in Scotland, and is about 44 miles from it. It is about 44 miles in length and 30 in breadth. It ſends 14 members to parliament, two for the county, and 12 for the following boroughs, Down-Patrick, Newry, Newtown, Killeleagh, Bangor, and Hillſborough.

This county is rough and full of hills, and yet the air is temperate and healthy. The ſoil naturally produces wood, unleſs conſtantly kept open and ploughed; and the low grounds degenerate into bogs and moſs, where the drains are neglected. But by the induſtry of the inhabitants it produces good crops of corn, particularly oats; and, where marl is found, barley. This laſt is exported from Killogh to Dublin. The ſtaple commodity of this county is the linen manufacture.

Down, or *Down-Patrick*, a town of Ireland, in the county of Down, is one of the moſt ancient in that kingdom. It is a market-town and a biſhoprick, ſaid to be erected in the fifth century by St Patrick, but is now united to the ſee of Connor. Within 200 paces of the town, on the aſcent of a hill, are the ruins of an old cathedral, remarkable for the tomb of St Patrick the founder, in which they ſay the bodies of St Bridget and St Columb are alſo laid. The town, which is ſeated on the ſouth corner of Lough Coin, now called the *lake of Strangford*, is adorned with ſeveral handſome public buildings. Among the hills, and in many iſlands, are flights of ſwans and other water-fowl; and the Lough abounds with ſalmon, mullets, and other ſea-fiſh. About a mile from this town is St Patrick's well, which many people frequent to drink at ſome ſeaſons of the year, and others to perform a penance enjoined them by the popiſh prieſts. The linen manufacture is carried on here, as it is in ſeveral places in this country. W. Long. 5. 50. N. Lat. 54. 23.

Down, the fine feathers from the breaſts of ſeveral birds, particularly of the duck kind.—That of the eider-duck (ſee Anas, n° 17.) is the moſt valuable. Theſe birds pluck it from their breaſts and line their neſts with it. We are told that the quantity of down found in one neſt more than filled the crown of an hat, yet weighed no more than three quarters of an ounce. Br. Zool.—Three pounds of this down may be compreſſed into a ſpace ſcarce bigger than one's fiſt; yet is afterwards ſo dilatable as to fill a quilt five feet ſquare. Salern. Orn. p. 416.—That found in the neſts is moſt valued, and termed *live down;* it is infinitely more elaſtic than that plucked from the dead bird, which is little eſteemed in Iceland. The beſt ſort is ſold at 45 fiſh *per* pound when cleanſed, and at 16 when not cleanſed. There are generally exported every year, on the company's account, fifteen hundred or two thouſand pounds of both ſorts, excluſive of what is privately exported by foreigners. In 1750 the Iceland Company ſold as much in quantity of this article as amounted to three thouſand ſeven hundred and forty-five banco-dollars, beſides what was ſent directly to Gluckſtadt.—Von Troil. p. 146.

Down or hair of plants. See Hair.

DOWNETON, or Dunkton, a borough-town of Wiltſhire, five miles ſouth of Saliſbury. It ſends two members to parliament.

DOWNHAM, a market-town of Norfolk, 10 miles ſouth of Lynn, famous for its good butter; there being 1000, and ſometimes 2000, firkins bought here every Monday, and ſent up the river Ouſe to Cambridge, from whence it is conveyed to London in the Cambridge-waggons.

DOWNS, a bank or elevation of ſand, which the ſea gathers and forms along its ſhores; and which ſerves it as a barrier. The word is formed from the French *dune*, of the Celtic *dum*, a "mountain." Charles de Viſch. in his *Compend. Chronolog. Exord. & Progreſſ. Abbat. Clariſſ. B. Mariæ, de Dunis*, ſays, *Vallem reperit arenarum collibus (quos incolæ* Duynen *vocant) undique cinctam.*

Downs are particularly uſed for a famous road for ſhips, along the eaſtern coaſt of the county of Kent, from Dover to the North Foreland; where both the outward and homeward-bound ſhips frequently make ſome ſtay; and ſquadrons of men of war rendezvous in time of war.

It affords excellent anchorage; and is defended by the caſtles of Deal, Dover, and Sandwich.

DOWRY, the money or fortune which the wife brings her huſband in marriage: it is otherwiſe called *maritagium*, marriage-goods, and differs from dower. See Dower.

DOXOLOGY, an hymn uſed in praiſe of the Almighty, diſtinguiſhed by the title of *greater* and *leſſer*.

The leſſer doxology was anciently only a ſingle ſentence, without reſponſe, running in theſe words, *Glory be to the Father, and to the Son, and to the Holy Ghoſt, world without end, Amen.* Part of the latter clauſe, *As it was in the beginning, is now, and ever ſhall be*, was inſerted ſome time after the firſt compoſition. Some read this ancient hymn, *Glory be to the Father, and to the Son with the Holy Ghoſt.* Others, *Glory be to the Father in or by the Son, and by the Holy Ghoſt.* This difference of expreſſion occaſioned no diſputes in the church, till the riſe of the Arian hereſy; but when the followers of Arius began to make uſe of the latter as a diſtinguiſhing character of their party, it was entirely laid aſide by the Catholics, and the uſe of it was enough to bring any one under ſuſpicion of heterodoxy.

The doxology was uſed at the cloſe of every ſolemn office. The weſtern church repeated it at the end of every pſalm, and the eaſtern church at the end of the laſt pſalm. Many of their prayers were alſo concluded with it, particularly the ſolemn thankſgiving or conſecration prayer at the euchariſt. It was alſo the ordinary concluſion of their ſermons.

The greater doxology, or angelic hymn, was likewiſe of great note in the ancient church. It began with theſe words, which the angels ſung at our Saviour's birth, *Glory be to God on high, &c.* It was chiefly uſed in communion ſervice, and in mens private devotions. Both the doxologies have a place in the church of England, the former being repeated after every pſalm, and the latter uſed in the communion ſervice.

DRABA, in botany: A genus of the ſiliculoſa order, belonging to the tetradynamia claſs of plants; and in the natural method ranking under the 39th order, *Siliquoſæ.* The ſilicula is entire, and oval oblong; with the valves a little plane, parallel to the partition: there is no ſtyle. There are ſix ſpecies; of which the only one worthy of notice is the verna, or early whitlow-graſs. It hath naked ſtalks, with leaves a little ſerrated. The bloſſoms are white, and at night the flowers hang down. It grows on old walls and dry banks. It is one of the earlieſt flowering plants we have, and is good to eat as a ſalad. Goats, ſheep, and horſes eat it; cows are not fond of it; ſwine refuſe it.

DRABLER, in the ſea-language, a ſmall ſail in a ſhip, which is the ſame to a bonnet that a bonnet is to a courſe, and is only uſed when the courſe and bonnet are too ſhoal to clothe the maſt. See Bonnet and Course.

DRABLING, in angling, is a method of catching barbels. Take a ſtrong line of ſix yards; which, before you faſten it to your rod, muſt be put through a piece of lead, that if the fiſh bite, it may ſlip to and fro, and that the water may ſomething move it on the ground; bait with a lobe worm well ſecured, and ſo by its motion the barbel will be enticed into the danger without ſuſpicion. The beſt places are in running water near piles, or under wooden bridges, ſupported with oaks floated and ſlimy.

DRABS, in the ſalt-works, a kind of wooden boxes for holding the ſalt when taken out of the boiling pan; the bottoms of which are made ſhelving or inclining forwards, that the briny moiſture of the ſalt may drain off.

DRAC, an imaginary being, much dreaded by the country people in many parts of France. The dracs are ſuppoſed to be malicious or at leaſt trickſome demons; but, which is very rare, if one of them happens to take a fancy to a man or woman, they are ſure to be the better for it. They are ſtill ſaid to lay gold cups and rings on the ſurface over pits and rivers, as baits to draw women and children in; though their uſual dwelling is ſome old empty houſe, whence they make excurſions in human form, viſible or inviſible as beſt ſuits their purpoſe. The country folks ſhudder at the very name of the drac. Some are poſitive that they have ſeen him; for happy indeed is that village in which there is not a houſe execrated as the lurking-place of this tremendous drac.

DRACÆNA, in botany; a genus of the monogynia order, belonging to the hexandria claſs of plants. The corolla is ſexpartite and erect; the filaments a little thicker about the middle; the berry trilocular and monoſpermous.

DRACHM, a Grecian coin, of the value of ſevenpence three farthings. Drachm is alſo a weight uſed by our phyſicians; containing juſt ſixty grains three ſcruples, or the eighth part of an ounce.

DRACO, a celebrated lawgiver of Athens. When he exerciſed the office of archon, he made a code of laws for the uſe of his citizens, which, on account of their ſeverity, were ſaid to be written in letters of blood. By them idleneſs was puniſhed with as much ſeverity as murder, and death was denounced againſt the one as well as the other. Such a code of rigorous laws gave occaſion to a certain Athenian to aſk of the legiſlator, why he was ſo ſevere in his puniſhments? and Draco gave for anſwer, that as the ſmalleſt tranſgreſſion had appeared to him deſerving death, he could not find any puniſhment more rigorous for more atrocious crimes. Theſe laws were at firſt enforced, but they were often neglected on account of their extreme ſeverity; and Solon totally aboliſhed them, except that one which puniſhed a murderer with death. The popularity of Draco was uncommon, but the gratitude of his admirers proved fatal to him. When once he appeared on the theatre, he was received with repeated applauſe; and the people, according to the cuſtom of the Athenians, ſhowed their reſpect to their lawgiver by throwing garments upon him. This was done in ſuch profuſion, that Draco was ſoon hid under them, and ſmothered by the too great veneration of his citizens. He lived about 624 years before the Chriſtian era.

Draco, the *Dragon*, in zoology, a genus belongraco ‖ acon- um.

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ing to the order of amphibia reptilia; the characters of which are theſe: it has four legs, a cylindrical tail, and two membranaceous wings, radiated like the fins of a fiſh, by which he is enabled to fly, but not to any great diſtance at a time. There are two ſpecies. 1. The volans, or flying dragon, with the wings entirely diſtinct from the fore-legs. It is found in Africa and the Eaſt Indies. 2. The præpos, with the wings fixed to the fore-legs. It is a native of America. They are both harmleſs creatures; and feed upon flies, ants, and ſmall inſects.

*Draco Volans*, in meteorology, a fiery exhalation, frequent in marſhy and cold countries.

It is moſt common in ſummer; and though principally ſeen playing near the banks of rivers, or in boggy places, yet ſometimes mounts up to a conſiderable height in the air, to the no ſmall terror of the amazed beholders; its appearance being that of an oblong, ſometimes roundiſh, fiery body, with a long tail. It is entirely harmleſs, frequently ſticking to the hands and cloaths of people without injuring them in the leaſt.

Draco, in aſtronomy, a conſtellation of the northern hemiſphere; whoſe ſtars, according to Ptolemy, are 81; according to Tycho, 32; according to Hevelius, 40; according to Bayer, 33; and according to Mr Flamſteed, 80. See Astronomy, n° 406.

DRACOCEPHALUM, dragon's head; a genus of the gymnoſpermia order, belonging to the didynamia claſs of plants. The throat of the corolla is inflated, the upper lip concave. There are 13 ſpecies, moſt of them herbaceous, annual, or perennial plants, from 18 inches to three feet high, garniſhed moſtly with entire leaves, and whorled ſpikes of ſmall monopetalous and ringent flowers of a blue, white, or purple colour. They are all eaſily propagated by ſeeds, which may be ſown either in the ſpring or autumn; and after the plants are come up they will require no other culture but to be kept clear from weeds.

DRACONARIUS, in antiquity, dragon-bearer. Several nations, as the Perſians, Parthians, Scythians, &c. bore dragons on their ſtandards; whence the ſtandards themſelves were called *dracones*, "dragons." The Romans borrowed the ſame cuſtom from the Parthians; or, as Caſaubon has it, from the Dacæ; or, as Codin, from the Aſſyrians.

The Roman dracones were figures of dragons painted in red on their flags, as appears from Ammianus Marcellinus: but among the Perſians and Parthians they were like the Roman eagles, figures in full relievo; ſo that the Romans were frequently deceived, and took them for real dragons.

The ſoldier who bore the dragon or ſtandard was called by the Romans *draconarius;* and by the Greeks δρακωναριος and δρακοντειοφορος; for the emperors carried the cuſtom with them to Conſtantinople.

DRACONTIC month, the time of one revolution of the moon from her aſcending node, called *caput draconis*, to her return thither.

DRACONTIUM, dragons: A genus of the polyandria order, belonging to the gynandria claſs of plants; and in the natural method ranking under the firſt order, *Palmæ*. The ſpatha is cymbiform, or ſhaped like a boat; the ſpadix covered all over; there is no calyx; there are five petals; the berries polyſpermous. There are five ſpecies, all natives of the Indies. The only one which makes any appearance is the pertuſum, with leaves having holes, and a climbing ſtalk. This is a native of moſt of the Weſt India iſlands. It hath trailing ſtalks which put out roots at every joint, that faſten to the trunks of trees, walls, or any ſupport which is near them, and thereby riſe to the height of 25 or 30 feet. The leaves are placed alternately upon long footſtalks: they are four or five inches long, two and an half broad; and have ſeveral oblong holes in each, which at firſt ſight appears as if eaten by inſects, but they are natural to the leaves. The flowers are produced at the top of the ſtalk, which always ſwells to a much larger ſize in that part than in any other: theſe are covered with an oblong ſpatha or hood of a whitiſh green colour, which opens longitudinally on one ſide, and ſhows the piſtil, which is cloſely covered with flowers of a pale yellow, inclining to white. This plant is eaſily propagated by cuttings; which if planted in pots filled with poor ſandy earth, and plunged into a hot-bed, will ſoon put out roots; but the plants are ſo tender, that they muſt be preſerved in a ſtove.

Dracunculi ‖ Dragon.

DRACUNCULI, in medicine, ſmall long worms which breed in the muſcular parts of the arms and legs, called *Guinea worms*. The common way of getting out theſe worms is by the point of a needle; and to prevent their forming there again, the uſual cuſtom is to waſh the parts with wine or vinegar, with alum, nitre, or common ſalt, or with a ſtrong lixivium of oak-aſhes, and afterwards anointing them with an ointment of the common kind uſed for ſcorbutic eruptions, with a ſmall mixture of quickſilver.

DRACUNCULUS, in botany. See Arum.

DRAFF, a name given in ſome places to the waſh given to hogs, and the grains given to cows.

DRAG, in building. A door is ſaid to *drag* when in opening or ſhutting it hangs or grates upon the floor.

Drag, in ſea-language, is a machine conſiſting of a ſharp, ſquare, iron ring, encircled with a net, and commonly uſed to take the wheel off from the platform or bottom of the decks.

DRAGOMAN, or Drogman, a term of general uſe through the Eaſt for an interpreter, whoſe office is to facilitate commerce between the orientals and occidentals. Theſe are kept by the ambaſſadors of Chriſtian nations reſiding at the Porte for this purpoſe.

The word is formed from the Arabic *targeman* or *targiman*, of the verb *taragem*, "he has interpreted." From *dragoman* the Italians formed *dragomano*, and, with a nearer relation to its Arabic etymology, *turcimanno;* whence the French and our *trucheman*, as well as *dragoman* and *drogman*.

DRAGON, in aſtronomy. See Draco.

*Dragon's Head and Tail (caput & cauda draconis)*, are the nodes of the planets; or the two points wherein the ecliptic is interſected by the orbits of the planets, and particularly that of the moon; making with it angles of five degrees and eighteen minutes. One of theſe points looks northward; the moon beginning then to have northward latitude, and the other ſouthward, where ſhe commences ſouth. Thus her deviation from the ecliptic ſeems (according to the fancy of ſome) to make a figure like to that of a dragon, whoſe belly is where ſhe has the greateſt latitude; the interſection

Dragon. ſection repreſenting the head and tail, from which reſemblance the denomination ariſes.

But note, that theſe points abide not always in one place, but have a motion of their own in the zodiac, and retrograde-wiſe 3 minutes 11 ſeconds *per* day; completing their circle in 18 years 225 days: ſo that the moon can be but twice in the ecliptic during her monthly period, but at all other times ſhe will have a latitude or declination from the ecliptic.

It is about theſe points of interſection that all eclipſes happen. They are uſually denoted by theſe characters ☊ dragon's head, and ☋ dragon's tail.

Dragon, in zoology. See Draco.

*Dragon's Blood*, a gummi-reſinous ſubſtance brought from the Eaſt Indies, either in oval drops wrapped up in flag leaves, or in large maſſes compoſed of ſmaller tears. It is ſaid to be obtained from the palmijuncus draco, the calamus rotang, the dracena draco, the pterocarpus draco, and ſeveral other vegetables.

The writers on the materia medica in general give the preference to the former, though the others are not unfrequently of equal goodneſs. The fine dragon's blood of either ſort breaks ſmooth, free from any viſible impurities, of a dark red colour, which changes upon being powdered into an elegant bright crimſon. Several artificial compoſitions, coloured with the true dragon's blood, or Brazil wood, are ſometimes ſold in the room of this commodity. Some of theſe diſſolve like gums in water; others crackle in the fire without proving inflammable; whilſt the genuine ſanguis draconis readily melts and catches flame, and is not acted on by watery liquors. It totally diſſolves in pure ſpirit, and tinges a large quantity of the menſtruum of a deep red colour. It is likewiſe ſoluble in expreſſed oils, and gives them a red hue, leſs beautiful than that communicated by anchuſa. This drug in ſubſtance has no ſenſible ſmell or taſte; when diſſolved, it diſcovers ſome degree of warmth and pungency. It is uſually, but without foundation, looked upon as a gentle aſtringent; and ſometimes directed as ſuch in extemporaneous preſcription againſt ſeminal gleets, the fluor albus, and other fluxes. In theſe caſes, it is ſuppoſed to produce the general effects of reſinous bodies, lightly incraſſating the fluids, and ſomewhat ſtrengthening the ſolids. But in the preſent practice it is very little uſed either externally or internally.

A ſolution of dragon's blood in ſpirit of wine is uſed for ſtaining marble, to which it gives a red tinge, which penetrates more or leſs deeply according to the heat of the marble during the time of application. But as it ſpreads at the ſame time that it ſinks deep, for fine deſigns the marble ſhould be cold. Mr du Fay ſays, that by adding pitch to this ſolution the colour may be rendered deeper.

*Dragon-Fiſh*, or *Dragonet*, in ichthyology. See Callionymus.

*Dragon-Fly*. See Libellula.

*Dragon-Shell*, in natural hiſtory, a name given by people curious in ſhells to a ſpecies of concamerated patella or limpet. This has a top very much bent; and is of an aſh-colour on the outſide, but of an elegant and bright fleſh-colour within. This has been found ſticking on the back of a tortoiſe, as the common limpets do on the ſides of rocks; and ſome have been found affixed to large ſhells of the pinna marina brought from the Eaſt Indies at different times.

Dragons, in botany. See Dracontium.

DRAGONET, or *Dragon-Fiſh*, in ichthyology. See Callionymus.

DRAGONNEE, in heraldry. A lion dragonnée is where the upper half reſembles a lion, the other half going off like the hinder part of a dragon. The ſame may be ſaid of any other beaſt as well as a lion.

DRAGOON, in military affairs, a muſqueteer mounted on horſeback, who ſometimes fights or marches on foot, as occaſion requires.

Menage derives the word *dragoon* from the Latin *draconarius*, which in Vegetius is uſed to ſignify *ſoldier*. But it is more probably derived from the German *tragen* or *dragen*, which ſignifies *to carry*; as being infantry carried on horſeback.

Dragoons are divided into brigades as the cavalry; and each regiment into troops; each troop having a captain, lieutenant, cornet, quarter-maſter, two ſerjeants, three corporals, and two drums. Some regiments have hautboys. They are very uſeful on any expedition that requires diſpatch; for they can keep pace with the cavalry, and do the duty of infantry: they encamp generally on the wings of the army, or at the paſſes leading to the camp; and ſometimes they are brought to cover the general's quarters: they march in the front and rear of the army.

The firſt regiment of dragoons raiſed in England was in 1681, and called the regiment of dragoons of North Britain. In battle or attacks they generally fight ſword in hand after the firſt fire. Their arms are, a ſword, firelock, and bayonet. In the French ſervice, when the dragoons march on foot, their officers bear the pike and the ſerjeants the halbert, neither of which are uſed in the Engliſh ſervice.

DRAGOONING, one of the methods uſed by Papiſts for converting refractory heretics, and bringing them within the pale of the true church.

The following method of dragooning the French Proteſtants, after the revocation of the edict of Nantes, under Louis XIV. is taken from a French piece, tranſlated in 1686.

The troopers, ſoldiers, and dragoons went into the Proteſtants houſes, where they marred and defaced their houſehold ſtuff, broke their looking-glaſſes, and other utenſils and ornaments, let their wine run about their cellars, and threw about their corn and ſpoiled it. And as to thoſe things which they could not deſtroy in this manner, ſuch as furniture of beds, linen, wearing apparel, plate, &c. they carried them to the market-place, and ſold them to the Jeſuits and other Roman catholics. By theſe means the Proteſtants in Montaubon alone were, in four or five days, ſtripped of above a million of money. But this was not the worſt.

They turned the dining-rooms of gentlemen into ſtables for their horſes: and treated the owners of the houſes where they quartered with the higheſt indignity and cruelty, laſhing them about from one to another, day and night, without intermiſſion, not ſuffering them to eat or drink; and when they began to ſink under the fatigue and pains they had undergone, they laid them on a bed, and when they thought them ſome-

ſomewhat recovered, made them riſe, and repeated the ſame tortures. When they ſaw the blood and ſweat run down their faces and other parts of their bodies, they ſluiced them with water, and putting over their heads kettle-drums, turned upſide down, they made a continual din upon them till theſe unhappy creatures loſt their ſenſes. When one party of theſe tormentors were weary, they were relieved by another, who practiſed the ſame cruelties with freſh vigour.

At Negrepliſſe, a town near Montaubon, they hung up Iſaac Favin, a Proteſtant citizen of that place, by his arm-pits, and tormented him a whole night, by pinching and tearing off his fleſh with pinchers. They made a great fire round a boy of about 12 years old, who, with hands and eyes lifted up to heaven, cried out, "My God, help me!" And when they found the youth reſolved to die rather than renounce his religion, they ſnatched him from the fire juſt as he was on the point of being burnt.

In ſeveral places the ſoldiers applied red-hot irons to the hands and feet of men and breaſts of women. At Nantes they hung up ſeveral women and maids by their feet, and others by their arm-pits, and thus expoſed them to public view ſtark naked. They bound to poſts mothers that gave ſuck, and let their ſucking infants lie languiſhing in their ſight for ſeveral days and nights, crying, mourning, and gaſping for life. Some they bound before a great fire, and being half roaſted, let them go; a puniſhment worſe than death. Amidſt a thouſand hideous cries and a thouſand blaſphemies, they hung up men and women by the hair, and ſome by their feet, on hooks in chimnies, and ſmoaked them with wiſps of wet hay till they were ſuffocated. They tied ſome under the arms with ropes, and plunged them again and again into wells; they bound others like criminals, put them to the torture, and with a funnel filled them with wine till the fumes of it took away their reaſon, when they made them ſay, they conſented to be catholics. They ſtripped them naked, and after a thouſand indignities, ſtuck them with pins and needles from head to foot. They cut and ſlaſhed them with knives; and ſometimes with red-hot pinchers took hold of them by the noſe and other parts of the body, and dragged them about the rooms till they made them promiſe to be catholics, or till the cries of theſe miſerable wretches, calling upon God for help, forced them to let them go. They beat them with ſtaves, and thus bruiſed, and with broken bones, dragged them to church, where their forced preſence was taken for an abjuration. In ſome places they tied fathers and huſbands to their bed-poſts, and before their eyes raviſhed their wives and daughters with impunity. They blew up men and women with bellows till they burſt them. If any to eſcape theſe barbarities endeavoured to ſave themſelves by flight, they purſued them into the fields and woods, where they ſhot at them like wild beaſts, and prohibited them from departing the kingdom (a cruelty never practiſed by Nero or Diocleſian) upon pain of confiſcation of effects, the galleys, the laſh, and perpetual impriſonment; inſomuch that the priſons of the ſea-port towns were crammed with men, women, and children, who endeavoured to ſave themſelves by flight from their dreadful perſecution. With theſe ſcenes of deſolation and horror, the popiſh clergy feaſted their eyes, and made them only a matter of laughter and ſport.

Though my heart akes (ſays the writer of the piece from which we are tranſcribing) whilſt I am relating theſe barbarities, yet for a perpetual memorial of the infernal cruelty practiſed by theſe monſters, I beg the reader's patience to lay before him two other inſtances, which, if he hath a heart like mine, he will not be able to read without watering theſe ſheets with his tears.

"The firſt is of a young woman, who being brought before the council, upon refuſing to abjure her religion, was ordered to priſon. There they ſhaved her head, ſinged off the hair from other parts of her body; and having ſtripped her ſtark naked, led her through the ſtreets of the city, where many a blow was given her, and ſtones flung at her: then they ſet her up to the neck in a tub full of water, where, after ſhe had been for a while, they took her out, and put on her a ſhift dipt in wine, which, as it dried and ſtuck to her ſore and bruiſed body, they ſnatched off again, and then had another ready dipped in wine to clap on her. This they repeated ſix times, thereby making her body exceeding raw and ſore. When all theſe cruelties could not ſhake her conſtancy, they faſtened her by her feet in a kind of gibbet, and let her hang in that poſture, with her head downward, till ſhe expired.

"The other is of a man in whoſe houſe were quartered ſome of theſe miſſionary dragoons. One day, having drank plentifully of his wine, and broken their glaſſes at every health, they filled the floor with the fragments, and by often walking over them reduced them to very ſmall pieces. This done, in the inſolence of their mirth, they reſolved on a dance, and told their Proteſtant hoſt that he muſt be one of their company; but as he would not be of their religion, he muſt dance quite barefoot; and thus barefoot they drove him about the room, treading on the ſharp points of the broken glaſſes. When he was no longer able to ſtand, they laid him on a bed, and, in a ſhort time, ſtripped him ſtark naked, and rolled him from one end of the room to the other, till every part of his body was full of the fragments of glaſs. After this they dragged him to his bed, and having ſent for a ſurgeon, obliged him to cut out the pieces of glaſs with his inſtruments, thereby putting him to the moſt exquiſite and horrible pains that can poſſibly be conceived.

"These, fellow Proteſtants, were the methods uſed by the moſt Chriſtian king's apoſtolic dragoons to convert his heretical ſubjects to the Roman catholic faith! Theſe, and many other of the like nature, were the torments to which Louis XIV. delivered them over to bring them to his own church! and as popery is unchangeably the ſame, theſe are the tortures prepared for you, if ever that religion ſhould be permitted to become ſettled amongſt you; the conſideration of which made Luther ſay of it, what every man that knows any thing of Chriſtianity muſt agree with him in, 'If you had no other reaſon to go out of the Roman church, this alone would ſuffice, that you ſee and hear, how, contrary to the law of God, they ſhed innocent blood. This ſingle circumſtance ſhall, God willing, ever ſeparate me from the papacy. And if I was now ſubject to it, and could blame nothing in any of their doctrines; yet for this crime

of

of cruelty, I would fly from her communion, as from a den of thieves and murderers."

DRAGS, in the ſea-language, are whatever hangs over the ſhip in the ſea, as ſhirts, coats, or the like; and boats, when towed, or whatever elſe that after this manner may hinder the ſhip's way when ſhe ſails, are called *drags*.

DRAINS, a name given, in the fen countries, to certain large cuts or ditches of 20, 30, nay ſometimes 40 feet wide, carried through the marſhy ground to ſome river or other place capable of diſcharging the water they carry out of the fen-lands.

An effectual method of drawing off the water from ſuch grounds as are hurt by ſprings oozing out upon them (uſually diſtinguiſhed by the name of *wet* or *ſpouting* ground, or *bogs*), has been a deſideratum in agriculture. Mr Anderſon is almoſt the only perſon who hath treated this matter ſcientifically, and his obſervations ſeem to be very rational and well founded.

*Eſſays on Agriculture*, Vol. II. p. 119, &c.

"Springs (ſays he) are formed in the bowels of the earth, by water percolating through the upper ſtrata where that is of a porous texture, which continues to deſcend downwards till it meets with a ſtratum of clay that intercepts it in its courſe; where, being collected in conſiderable quantities, it is forced to ſeek a paſſage through the porous ſtrata of ſand, gravel, or rock, that may be above the clay, following the courſe of theſe ſtrata till they approach the ſurface of the earth, or are interrupted by any obſtacle which occaſions the water to riſe upwards, forming ſprings, bogs, and the other phenomena of this nature; which being variouſly diverſified in different circumſtances, produce that variety of appearances in this reſpect that we often meet with.

"This being the caſe, we may naturally conclude, that an abundant ſpring need never be expected in any country that is covered to a great depth with ſand without any ſtratum of clay to force it upwards, as is the caſe in the ſandy deſerts of Arabia, and the immeaſurable plains of Libya: neither are we to expect abundant ſprings in any ſoil that conſiſts of an uniform bed of clay from the ſurface to a great depth; for it muſt always be in ſome porous ſtratum that the water flows in abundance; and it can be made to flow horizontally in that, only when it is ſupported by a ſtratum of clay, or other ſubſtance that is equally impermeable by water. Hence the *rationale* of that rule ſo univerſally eſtabliſhed in digging for wells, that if you begin with ſand or gravel, &c. you need ſeldom hope to find water till you come to clay; and if you begin with clay, you can hope for none in abundance till you reach to ſand, gravel, or rock.

"It is neceſſary that the farmer ſhould attend to this proceſs of nature with care, as his ſucceſs in draining bogs, and every ſpecies of damp and ſpouting ground, will in a great meaſure depend upon his thorough knowledge of this,—his acuteneſs in perceiving in every caſe the variations that may be occaſioned by particular circumſtances, and his ſkill in varying the plan of his operations according to theſe. As the variety of caſes that may occur in this reſpect is very great, it would be a very tedious taſk to enumerate the whole, and deſcribe the particular method of treating each; I ſhall therefore content myſelf with enumerating a few particular caſes, to ſhow in what manner the principles above eſtabliſhed may be applied to practice.

Plat CLX

"Let fig. 1. repreſent a perpendicular ſection of a part of the earth, in which AB is the ſurface of the ground, beneath which are ſeveral ſtrata of porous ſubſtances which allow the water to ſink through them till it reaches the line CD, that is ſuppoſed to repreſent the upper ſurface of a ſolid bed of clay; above which lies a ſtratum of rock, ſand, or gravel. In this caſe, it is plain, that when the water reaches the bed of clay, and can ſink no farther, it muſt be there accumulated into a body; and ſeeking for itſelf a paſſage, it flows along the ſurface of the clay, among the ſand or gravel, from D towards C; till at laſt it iſſues forth, at the opening A, a ſpring of pure water.

"If the quantity of water that is accumulated between D and C is not very conſiderable, and the ſtratum of clay approaches near the ſurface; in that caſe, the whole of it will iſſue by the opening at A, and the ground will remain dry both above and below it. But, if the quantity of water is ſo great as to raiſe it to a conſiderable height in the bed of ſand or gravel, and if that ſtratum of ſand is not diſcontinued before it reaches the ſurface of the ground, the water, in this caſe, would not only iſſue at A, but would likewiſe ooze out in ſmall ſtreams thro' every part of the ground between A and *a*; forming a barren patch of wet ſandy or gravelly ground upon the ſide of a declivity, which every attentive obſerver muſt have frequently met with.

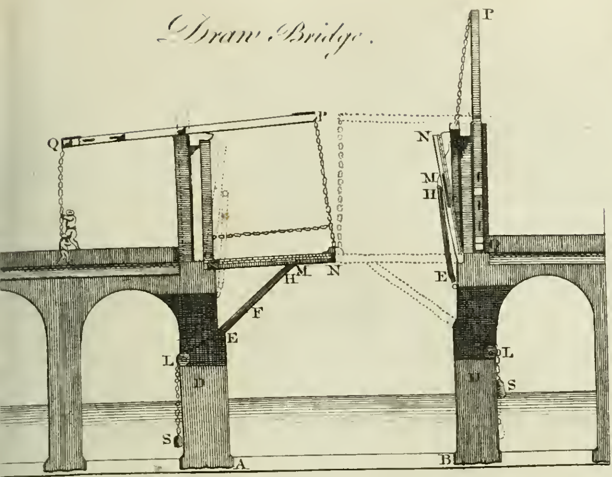
"To drain a piece of ground in this ſituation is perhaps the moſt unprofitable taſk that a farmer can engage in; not only becauſe it is difficult to execute, but alſo becauſe the ſoil that is gained is but of very little value. However, it is lucky that patches of this kind are ſeldom of great breadth, although they ſometimes run along the ſide of a declivity in a horizontal direction for a great length. The only effectual method of draining this kind of ground, is to open a ditch as high up as the higheſt of the ſprings at *a*, which ſhould be of ſuch a depth as not only to penetrate through the whole bed of ſand or gravel, but alſo to ſink ſo far into the bed of clay below, as to make a canal therein ſufficiently large to contain and carry off the whole of the water. Such a ditch is repreſented by the dotted lines *a e z*: but as the expence of making a ditch of ſuch a depth as this would ſuppoſe, and of keeping it afterwards in repair, is very great, it is but in very few caſes that this mode of draining would be adviſeable; and never, unleſs where the declivity happens to be ſo ſmall, as that a great ſurface is loſt for little depth, as would have been the caſe here if the ſurface had extended in the direction of the dotted line *a d*

"But ſuppoſing that the ſtratum of clay, after approaching toward the ſurface at A, continued to keep at a little depth below ground; and that the ſoil which lay above it was of a ſandy or ſpungy nature, ſo as to allow the water to penetrate it eaſily; even ſuppoſing the quantity of water that flowed from D to C was but very inconſiderable, inſtead of riſing out at the ſpring A, it would flow forward along the ſurface of the clay among the porous earth that forms the ſoil, ſo as to keep it conſtantly drenched with water, and of conſequence render it of very little value.

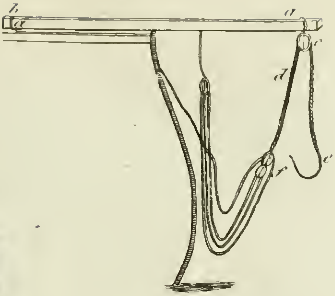
"Wetneſs

Plate CLXV.

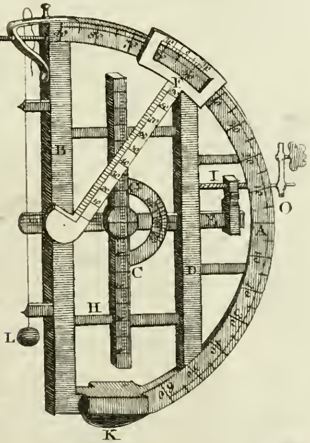
## Draw Bridge.



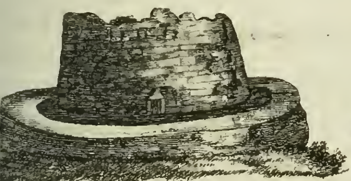
## Davit.



## Dendrometer, No. 1.



## A Dun or Burgh.



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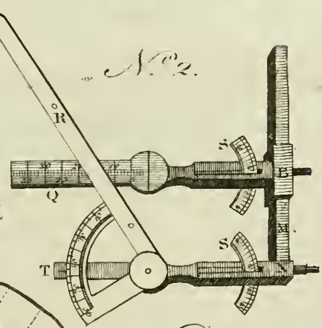


## Drains.

Fig. 4.

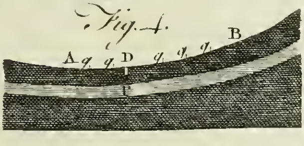


Fig. 3.

Fig. 1.

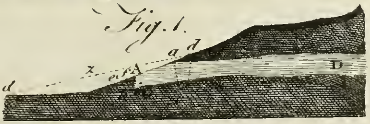


Fig. 5.

## Dead-eyes.

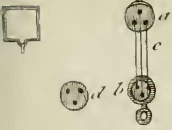
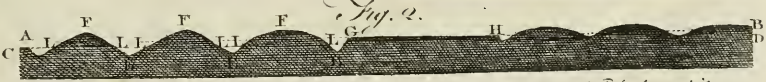


Fig. 2.



J. Bell Prin. Hal. Sculptor fecit.

“ Wetneſs ariſing from this cauſe, is uſually of much greater extent than the former: and, as it admits of an eaſy cure, it ought not to be one moment delayed; as a ditch of a very moderate depth opened at A, and carried through a part of the ſtratum of clay (as repreſented by the dotted lines A *k f*), would intercept and carry off the whole of the water, and render the field as dry as could be deſired. It is, therefore, of very great conſequence to the farmer, accurately to diſtinguiſh between theſe two caſes, ſo nearly allied to each other in appearance; and, as this can be eaſieſt done by boring, every one who has much ground of this kind ought to provide himſelf with a ſet of boring-irons, which he will likewiſe find uſe for on other occaſions.

“ I might here enumerate a great variety of caſes which might be reduced to the ſame head with the foregoing: but as any attentive reader may, after what has been ſaid, be able eaſily to diſtinguiſh theſe, I ſhall only in general obſerve, that every ſoil of a ſoft and porous texture, that lies upon a bed of hard clay, whatever its ſituation in other reſpects may be, will in ſome meaſure be ſubjected to this diſeaſe. And if it is upon a declivity of any conſiderable length, the undermoſt parts of the field will be much damaged by it, unleſs ditches are thrown up acroſs the declivity at proper diſtances from one another, to intercept the water in its deſcent.

“ It may not likewiſe be improper here to obſerve, that in caſes of this nature, unleſs where the ſoil is of a very great depth, the malady will always be increaſed, by raiſing the ridges to a conſiderable height; as will appear evident by examining fig. 2. in which the line A B repreſents the ſurface of a field of this nature, and C D the ſurface of the bed of clay. Now, if this field were raiſed into high ridges, as at F F F, ſo that the furrows E E E deſcended below the ſurface of the clay, it is plain, that all the water that ſhould ſink through the middle of the ridge, would run along the ſurface of the clay till it came to the ſides of the ridge L L L L L L, which would thus be kept continually ſoaked with water. Whereas, if the ground had been kept level, as in the part of the field from G to H, with open furrows H, at moderate diſtances from each other, the water would immediately ſink to the clay, and be carried off by the furrows, ſo as to damage the ſoil far leſs than when the ridges are high. If the ſoil is ſo thin as that the plough can always touch the clay, the ridges ought to be made narrow and quite flat, as from G to H: but if there is a little greater depth of ſoil, then it ought to be raiſed into ridges of a moderate height, as from H to B, ſo as to allow the bottom of the furrow to reach the clay: but neither is this neceſſary where the ſoil is of any conſiderable depth.

“ I have ſeen ſome induſtrious farmers, who having ground in this ſituation, have been at the very great expence of making a covered drain in each furrow. But, had they rightly underſtood the nature of the diſeaſe, they never would have thought of applying ſuch a remedy; as muſt appear evident at firſt ſight to thoſe who examine the figure. The ſucceſs was what might be expected from ſuch a fooliſh undertaking.

“ Theſe obſervations, it is hoped, will be ſufficient as to the manner of treating wet, ſandy, or porous ſoils. I now proceed to take notice of ſuch as are of a ſtiff clayey nature, which are often very different in appearance, and require a different treatment from theſe.

Plate CLXV.

“ Suppoſe that (in fig. 3.) the ſtratum of ſand or gravel D C ſhould be diſcontinued, as at E, and that the ſtratum above it ſhould be of a coherent clayey nature. In this caſe, the water that flowed towards E, being there pent in on every ſide, and being accumulated there in great quantities, it muſt at length force a paſſage for itſelf in ſome way; and preſſing ſtrongly upon the upper ſurface, if any one part is weaker than the reſt, it there would burſt forth and form a ſpring, (as ſuppoſe at A). But if the texture of every part of this ſtratum were equally ſtrong, the water would ſqueeze thro' many ſmall crannies, and would ooze out in numberleſs places, as between A and F, ſo as to occaſion that kind of wetneſs that is known by the name of a *ſpouting clayey ſoil*.

“ The cure, in this caſe, is much more eaſily effected than in any of the former; for if a ditch of a conſiderable ſize is opened, as at A, towards the lowermoſt ſide of the ſpouting ground, ſo deep as to penetrate through the upper ſtratum of clay, and reach to the gravel, the water will riſe up through it at firſt with very great violence, which will gradually decreaſe as the preſſure from the water behind is diminiſhed; and when the whole of the water accumulated in this ſubterraneous reſervoir is run off, there being no longer any preſſure upon the clay above it, the whole ſoon becomes as dry as could be deſired, and continues ſo ever afterwards, if the ditch is always kept open. This I ſpeak from experience, I having rendered ſome fields of this kind that were very wet, quite dry by this method of treating them.

“ It will hardly be neceſſary for me here to put the farmer upon his guard, to be particularly careful in his obſervations, that he may diſtinguiſh between the wetneſs that is produced from this cauſe, and that which proceeds from the cauſe before mentioned; becauſe the treatment that would cure the one would be of no uſe at all to the other. The attentive obſerver likewiſe will readily perceive, that if any field that is wet from this cauſe admits of being ploughed, it will be in equal danger of being hurt by being raiſed into high ridges, with the other kind of damp ground before mentioned. For as the depth of earth above the reſervoir would be ſmaller in the deep furrows than any where elſe, there would, of conſequence, be leſs reſiſtance to the water in that place, ſo that it would ariſe there in greater abundance. And if, in this caſe, a farmer ſhould dig a drain in each furrow, as a conſiderable quantity of water would riſe into them, in ſome caſes, the ground might be improved, or even quite drained thereby, eſpecially if they ſhould have accidentally reached the gravel in any one place; although at an expence much greater than was neceſſary. I take notice of this circumſtance in ſome meaſure to prevent the prejudice that ſome inattentive obſervers might entertain againſt what was ſaid before of this method of draining, from their having accidentally ſeen ſome fields that may have been bettered by it.

“ Bogs are only a variety of this laſt-mentioned kind of wet ground; and, therefore, ought in general to be drained after the ſame manner with them. Clay is a ſubſtance that ſtrongly reſiſts the entrance of water into it: but when it is long drenched with it, it is, in proceſs of time, in ſome meaſure diſſolved thereby; loſes its original firmneſs of texture and conſiſtence; and becomes a ſort of ſemi-fluid maſs, which is called a *bog;* and as theſe are ſometimes covered with a ſtrong ſcurf of a particular kind of graſs, with very matted roots, which is ſtrong enough to bear a ſmall weight without breaking, although it yields very much, it is in theſe circumſtances called a *ſwaggle.* But, whatever be the nature of the bog, it is invariably occaſioned by water being forced up through a bed of clay, as juſt now deſcribed, and diſſolving or ſoftening, if you will, a part thereof. I ſay only a part; becauſe whatever may be the depth of the bog or ſwaggle, it generally has a partition of ſolid clay between it and the reſervoir of water under it, from whence it originally proceeds: for if this were not the caſe, and the quantity of water were conſiderable, it would meet with no ſufficient reſiſtance from the bog, and would iſſue through it with violence, and carry the whole ſemi-fluid maſs along with it. But this would more inevitably be the caſe, if there was a cruſt at the bottom of the bog, and if that cruſt ſhould ever be broken, eſpecially if the quantity of water under it were very conſiderable: and as it is probable, that, in many caſes of this ſort, the water ſlowly diſſolves more and more of this under-cruſt, I make no doubt, but that, in the revolution of many ages, a great many eruptions of this kind may have happened, although they may not have been deemed of importance enough to have the hiſtory of them tranſmitted to poſterity. Of this kind, although formed of a different ſubſtance, I conſider the flow of the Solway-moſs in Northumberland to have been; which, upon the 16th of November 1771, burſt its former boundaries, and poured forth a prodigious ſtream of ſemi-fluid matter, which in a ſhort time covered ſeveral hundred acres of very fine arable ground. Nor will any one, who is acquainted with the nature of moſs,—who knows its reſemblance to clay in its quality of abſorbing and retaining water, and its very eaſy diffuſibility therein, be ſurpriſed at this; as, from all theſe properties, it is much better adapted for forming an extenſive bog, and therefore in greater danger of producing an extenſive devaſtation by an eruption of the water into it, than thoſe that are formed of any kind of clay whatever.

Fig 4.

If the bog, or ſwampy ground, is upon a declivity, the ditch ought to be carried acroſs the field about the place where the loweſt ſprings ariſe. But if the ſurface of the ground is level or nearly ſo, as between A and B, and the ſprings break out in ſeveral places, *qqqqqq*, ſo as to form ſoft quagmires interſperſed through the whole of the field, it will be of little conſequence in what part the drain is opened; for if it is dug up ſo deep as to allow the water to riſe in it with freedom, it will iſſue through that opening, and the field will be left perfectly dry.

" But as it may frequently happen that the ſtratum of gravel ſhould be at a conſiderable depth beneath the ſurface of the earth, and as it may be ſometimes even below the level of the place into which the drain muſt be emptied, it might ſometimes be extremely difficult to make a ditch ſo deep as to reach the bed of ſand or gravel. But it is lucky for us that this is not abſolutely neceſſary in the preſent caſe; as a drain of two or three feet deep, as at D, will be equally effectual with one that ſhould go to the gravel. All that is neceſſary in this caſe, is to ſink pits (P) in the courſe of the drain, at a moderate diſtance from one another, which go ſo deep as to reach the gravel; for as the water there meets with no reſiſtance, it readily flows out at theſe openings, and is carried off by the drain without being forced up through the earth; ſo that the ground is left entirely dry ever after.

" I have likewiſe drained ſeveral fields in this way; and as I have generally found the appearances pretty much alike, I ſhall, for the information of the inexperienced reader, give a ſhort account of them.

" If you attempt to make your pit in one of theſe ſoft quaggy places where the water is found in great abundance, you will meet with very great difficulty in forming it; for as the ſubſtance of which it is compoſed is ſoft, it will always flow into the hole as faſt as you dig it; on which account I would adviſe, not to attempt to make the pit in the ſwaggle, but as near it in the ſolid earth as you conveniently can. However, if it is pretty firm, and of no great extent, it is ſometimes practicable to make a pit in the ſoft bog at the drieſt time of the year. This I have ſometimes practiſed, which gave me an opportunity of obſerving the nature of theſe bogs more perfectly than I otherwiſe would have had. In the trials of this kind that I have made, this ſoft quaggy ground has ſeldom been above three or four feet deep, below which I have always found a ſtratum of hard tough clay uſually mixed with ſtones; and ſo firm, that nothing but a mattock or pick-axe could penetrate it: and as this is comparatively ſo much drier than the ground above it, an inexperienced operator is very apt to imagine that this is the bottom that he is in ſearch of. In digging thro' this ſtratum, you will frequently meet with ſmall ſprings oozing out in all directions; ſome of them that might fill the tube of a ſmall quill, and others ſo ſmall as to be ſcarce perceptible: but without regarding theſe, you muſt continue to dig on without intermiſſion till you come to the main body of the reſervoir, if I may ſo call it, that is contained in the rock, gravel, or ſand; which you will generally find from two to four feet below the bottom of the ſwaggle, and which you will be in no danger of miſtaking when you come to it: for, if there has been no opening made before that in the field, as ſoon as you break the cruſt immediately above the gravel or rock, the water burſts forth like a torrent, and on ſome occaſions riſes like a *jet d'eau*, to a conſiderable height above the bottom of the ditch; and continues to flow off with great impetuoſity for ſome time, till the pent-up water being drained off, the violent boiling up begins to ſubſide, and the ſtrength of the current to abate; and, in a ſhort time, it flows gently out like any ordinary ſpring;—allowing it to remain in this ſtate, the quaggy earth begins to ſubſide, and gradually becomes firmer and firmer every day; ſo that, in the ſpace of a few months, thoſe bogs which were formerly ſo ſoft as hardly to ſupport the weight of a ſmall dog, become ſo firm, that oxen and horſes may tread upon them without any danger of ſinking, at the very wetteſt ſeaſon of the year. I have had a field of this nature, that, by having only one ſuch pit as I have now deſcribed opened in it, was entirely drained to the diſtance of above a hundred yards around it in every direction. But as it is poſſible that the ſtratum in which the water runs may be in ſome places interrupted, it will be in general expedient to make ſeveral of theſe pits, if the field is of great extent; always carrying the drain forward thro' the lowermoſt part of the field, or as near the quag as you conveniently can; and ſinking a pit wherever you may judge it will be moſt neceſſary. But if the ſtratum of gravel is not interrupted, there will be no violent burſt of water at opening any of theſe after the firſt, as I have frequently experienced. To keep theſe wells from cloſing up after they are made, it is always expedient to fill them up with ſmall ſtones immediately after they are made, which ought to riſe to the height of the bottom of the drain.

"I have often imagined that the expence of digging theſe pits might be ſaved by boring a hole through this ſolid ſtratum of clay with a large wimble made on purpoſe; but as I never experienced this, I cannot ſay whether or not it would anſwer the deſired end exactly.

"If the whole field that is to be drained conſiſts of one extenſive bog, it will require a long time before the whole work can be entirely finiſhed, as it will be impoſſible to open a drain through it till one part of it is firſt drained and becomes ſolid ground. In a ſituation of this kind, the undertaker, after having opened a drain to convey the water from the loweſt part of the bog, muſt approach as near to the ſwampy ground as he can, and there make his firſt pit; which will drain off the water from the neareſt parts of the bog. When this has continued open for ſome time, and that part of the bog is become ſo ſolid as to admit of being worked, let him continue the ditch as far forward thro' it as the ſituation it is in will admit of, and there ſink another pit; and proceed gradually forward in the ſame manner; making croſs cuts where neceſſary, till the whole be finiſhed.

"In this manner may any bog or track of ſpouting ground of this nature be rendered dry at a very inconſiderable expence; and as there can be no other method of draining ground of this ſort effectually, I recommend the ſtudy of it to the attention of every diligent farmer who may have occaſion for it. Let him firſt be extremely cautious in examining all the circumſtances of his particular fields, that he may be certain which of the claſſes above enumerated it may be ranked with; and, when he is perfectly ſure of that, he may proceed without fear, being morally certain of ſucceſs.

"There is, however, one kind of damp ground not yet particularly ſpecified, that I have purpoſely omitted taking notice of till this time, as I have never had any opportunity of examining particularly into the nature of it, nor of aſcertaining by experience what is the moſt proper method of treating it.—The ſoil I have now particularly in my eye conſiſts of a deep ſtrong clay that does not vary its nature even on the ſurface, but in as far as manures may have rendered it more friable and tender: the colour uſually inclines to a reddiſh caſt, and, for the moſt part, it is ſituated upon the ſide of ſome declivity. This bed of clay reaches to a great depth, without any variation, and is intermixed with a conſiderable quantity of ſmall round ſtones. Many ſoils of the ſort now deſcribed, are apt to be continually moiſt and full of water during the winter ſeaſon; but when the dry weather of ſummer ſets in, the moiſture is diminiſhed, and the ſurface becomes hard, and it is rent into many large gaps which allow free admiſſion to the ſun and air, ſo as to ſcorch up almoſt every plant that is ſowed upon it: and as theſe ſoils are uſually in themſelves naturally fertile when drained, it were to be wiſhed that ſome method could be diſcovered that would be leſs expenſive than what is uſually practiſed with regard to ſome ſoils of this kind in Eſſex; where they make covered drains of two and a half feet deep, running diagonally through the whole field, at the diſtance of 20 feet from each other."

Concerning the making of theſe drains we have the following directions in the Georgical Eſſays, by T. B. Bayley, Eſq; of Hope near Mancheſter.—"Firſt make the main drains down the ſlope or fall of the field. When the land is very wet, or has not much fall, there ſhould, in general, be two of theſe to a ſtatute acre; for the ſhorter the narrow drains are, the leſs liable they will be to accidents. The width of the trench for the main drains ſhould be 30 inches at top, but the width at the bottom muſt be regulated by the nature and ſize of the materials intended to be uſed. If the drain is to be made of bricks 10 inches long, 3 inches thick, and 4 inches in breadth, then the bottom of the drain muſt be 12 inches; but if the common ſale bricks are uſed, then the bottom muſt be proportionably contracted. In both caſes there muſt be an interſtice of one inch between the bottom brick and the ſides of the trench, and the vacuity muſt be filled up with ſtraw, ruſhes, or looſe mould. For the purpoſe of making theſe drains, I order my bricks to be moulded 10 inches long, 4 broad, and 3 thick; which dimenſions always make the beſt drain.

"The method I purſue in conſtructing my main drains is as follows.—When the ground is ſoft and ſpongy, the bottom of the drain is laid with bricks placed acroſs. On theſe, on each ſide, two bricks are laid flat, one upon the other, forming a drain ſix inches high and four broad; which is covered with bricks laid flat. When the bottom of the trench is found to be a firm and ſolid body, as clay or marle, the bottom of the drain does not then require being laid with bricks. In that caſe the ſides are formed by placing one brick edgewiſe, inſtead of two laid flat.

"This latter method is much cheaper, and in ſuch land equally durable with the other. When ſtones are uſed inſtead of bricks, the bottom of the drain ſhould be about eight inches in width. And here it will be proper to remark, that, in all caſes, the bottom of the main drains muſt be ſunk four inches below the level of the narrow ones, even at the point where the latter fall into them.

"The main drains ſhould be kept open till the narrow ones are begun from them, after which they may be finiſhed; but before the earth is returned upon the ſtones or bricks, it will be adviſeable to throw in ſtraw, ruſhes, or bruſh-wood, to increaſe the freedom of the drain.

"The ſmall narrow drains ſhould be cut at the diſtance of 16 or 18 feet from each other; and ſhould fall into the main drain at very acute angles, to prevent any ſtoppage. At the point where they fall in, and eight or ten inches above it, they ſhould be made

Plate CLXV.

firm with brick or ſtone. Theſe drains ſhould be 18 inches wide at top, and 16 at bottom."—Fig. 5. repreſents a field with drains laid out according to Mr Bayley's method. The black lines repreſent the main drains, and the dotted lines repreſent the narrow drains communicating with the former from all parts of the field.

DRAKE, in ornithology, the male of the duck kind. See ANAS.

DRAKE (Sir Francis), the renowned Engliſh admiral, was the ſon of Edmund Drake a ſailor, and born near Taviſtock in Devonſhire, in the year 1545. He was brought up at the expence and under the care of Sir John Hawkins, who was his kinſman; and, at the age of 18, was purſer of a ſhip trading to Biſcay. At 20, he made a voyage to Guinea; and, at 22, had the honour to be made captain of the Judith. In that capacity he was in the harbour of St John de Ulloa, in the gulph of Mexico, where he behaved moſt gallantly in the glorious actions under Sir John Hawkins, and returned with him to England with great reputation, though not worth a groat. Upon this he projected a deſign againſt the Spaniards in the Weſt Indies; which he no ſooner publiſhed, than he had volunteers enough ready to accompany him. In 1570, he made his firſt expedition with two ſhips; and the next year with one only, in which he returned ſafe, if not with ſuch advantages as he expected. He made another expedition in 1572, wherein he did the Spaniards ſome miſchief, and gained conſiderable booties. In theſe expeditions he was much aſſiſted by a nation of Indians, who then were, and have been ever ſince, engaged in perpetual wars with the Spaniards. The prince of theſe people was named *Pedro*; to whom Drake preſented a fine cutlaſs from his ſide, which he ſaw the Indian greatly admired. Pedro, in return, gave him four large wedges of gold; which Drake threw into the common ſtock, ſaying, That he thought it but juſt that ſuch as bore the charge of ſo uncertain a voyage on his credit, ſhould ſhare the utmoſt advantage that voyage produced. Then, embarking his men with all the wealth he had obtained, which was very conſiderable, he bore away for England, where he arrived in Auguſt 1573.

His ſucceſs in this expedition, joined to his honourable behaviour towards his owners, gained him a high reputation; and the uſe he made of his riches, a ſtill greater. For, fitting out three ſtout frigates at his own expence, he ſailed with them to Ireland; where, under Walter earl of Eſſex, the father of the famous unfortunate earl, he ſerved as a volunteer, and did many glorious actions. After the death of his noble patron, he returned into England; where Sir Chriſtopher Hatton introduced him to her majeſty, and procured him countenance and protection at court. By this means he acquired a capacity of undertaking that grand expedition which will render his name immortal. The firſt thing he propoſed was a voyage into the South Seas through the Straits of Magellan; which was what hitherto no Engliſhman had ever attempted. The project was well received at court: the queen furniſhed him with means; and his own fame quickly drew together a ſufficient force. The fleet with which he ſailed on this extraordinary undertaking, conſiſted only of five veſſels, ſmall when compared with modern ſhips, and no more than 164 able men. He ſailed on the 13th of December 1577; on the 25th fell in with the coaſt of Barbary, and on the 29th with cape Verd. On the 13th of March he paſſed the equinoctial, made the coaſt of Brazil on the 5th of April, and entered the River de la Plata, where he loſt the company of two of his ſhips; but meeting them again, and taking out their proviſions, he turned them adrift. On the 29th of May he entered the port of St Julian's, where he continued two months for the ſake of laying in proviſions: on the 20th of Auguſt he entered the Straits of Magellan, and on the 25th of September paſſed them, having then only his own ſhip. On the 25th of November he came to Machao, which he had appointed for a place of rendezvous in caſe his ſhips ſeparated; but captain Winter, his vice admiral, having repaſſed the Straits, was returned to England. Thence he continued his voyage along the coaſts of Chili and Peru, taking all opportunities of ſeizing Spaniſh ſhips, and attacking them on ſhore, till his men were ſated with plunder; and then, coaſting America to the height of 48 degrees, he endeavoured to find a paſſage that way back into our ſeas, but could not. However, he landed, and called the country *New Albion*, taking poſſeſſion of it in the name and for the uſe of queen Elizabeth; and, having careened his ſhip, ſet ſail from thence, on the 29th of September 1579, for the Moluccas. He is ſuppoſed to have choſen this paſſage round, partly to avoid being attacked by the Spaniards at a diſadvantage, and partly from the lateneſs of the ſeaſon, whence dangerous ſtorms and hurricanes were apprehended. On the 13th of October he fell in with certain iſlands inhabited by the moſt barbarous people he had met with in all his voyage: on the 4th of November he had ſight of the Moluccas; and, coming to Ternate, was extremely well received by the king thereof, who appears, from the moſt authentic relations of this voyage, to have been a wiſe and polite prince. On the 10th of December he made Celebes; where his ſhip unfortunately ran upon a rock, the 9th of January following; from which, beyond all expectation, and in a manner miraculouſly, they got off, and continued their courſe. On the 16th of March he arrived at Java Major; and from thence he intended to have directed his courſe to Malacca; but found himſelf obliged to alter his purpoſe, and to think of returning home. On the 25th of March 1580, he put this deſign in execution; and on the 15th of June he doubled the Cape of Good Hope, having then on board 57 men, and but three caſks of water. On the 12th of July he paſſed the line, reached the coaſt of Guinea on the 16th, and there watered. On the 11th of September he made the iſland of Tercera; and on the 3d of November entered the harbour of Plymouth. This voyage round the world was performed in two years and about ten months. Shortly after his arrival, the queen going to Deptford, went on board his ſhip; where, after dinner, ſhe conferred on him the order of knighthood, and declared her abſolute approbation of all he had done. She likewiſe gave directions for the preſervation of his ſhip, that it might remain a monument of his own and his country's glory. This celebrated ſhip, which had been contemplated many years at Deptford, at length decaying, it was broke up, and a chair, made out of the planks, was preſented to the univerſity of Oxford; upon on which the famous Abraham Cowley made the following verſes:

" To this great ſhip, which round the world has run,
" And match'd in race the chariot of the ſun;
" This Pythagorean ſhip (for it may claim,
" Without preſumption, ſo deſerv'd a name,
" By knowledge once, and transformation now)
" In her new ſhape this ſacred port allow.
" Drake and his ſhip could not have wiſh'd, from fate,
" An happier ſtation, or more bleſs'd eſtate:
" For, lo! a ſeat of endleſs reſt is given,
" To her in Oxford, and to him in heaven.

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In the year 1585, he ſailed with a fleet to the Weſt Indies; and took the cities of St Jago, St Domingo, Carthagena, and St Auguſtin. In 1587, he went to Liſbon with a fleet of 30 ſail; and having intelligence of a great fleet aſſembled in the bay of Cadiz, which was to have made part of the armada, he with great courage entered that port, and burnt there upwards of 10,000 tons of ſhipping: which he afterwards merrily called *burning the king of Spain's beard*. In 1588, when the armada from Spain was approaching our coaſts, Sir Francis Drake was appointed vice-admiral under Charles lord Howard of Effingham, high admiral of England, where fortune favoured him as remarkably as ever: for he made prize of a very large galleon, commanded by Don Pedro de Valdez, who was reputed the projector of this invaſion. This affair happened in the following manner: On the 22d of July, Sir Francis obſerving a great Spaniſh ſhip floating at a diſtance from both fleets, ſent his pinnace to ſummon the commander to yield. Valdez replied, with much Spaniſh ſolemnity, that they were 450 ſtrong; that he himſelf was Don Pedro, and ſtood much upon his honour; and thereupon propounded ſeveral conditions, upon which he was willing to yield. But the vice-admiral replied, That he had no leiſure to parley: but if he thought fit inſtantly to yield, he might; if not, he ſhould ſoon find that Drake was no coward. Pedro, hearing the name of Drake, immediately yielded, and with 46 of his attendants came on board Drake's ſhip. This Don Pedro remained about two years Sir Francis Drake's priſoner in England; and, when he was releaſed, paid him for his own and his captains liberties, a ranſom of 3500l. Drake's ſoldiers were well recompenſed with the plunder of this ſhip; for they found in it 55,000 ducats of gold, which was divided among them.

A little before this formidable Spaniſh armament put to ſea, the ambaſſador of his Catholic majeſty had the confidence to propound to queen Elizabeth, in Latin verſe, the terms upon which ſhe might hope for peace; which, with an Engliſh tranſlation by Dr Fuller, we will inſert in this place, becauſe Drake's expedition to the Weſt Indies makes a part of this meſſage. The verſes are theſe:

*Te veto ne pergas bello defendere Belgas:*
*Quæ Dracus eripuit nunc reſtituantur oportet:*
*Quas pater evertit jubeo te condere cellas:*
*Religio Papæ fac reſtituatur ad unguem.*

" Theſe to you are our commands,
" Send no help to th' Netherlands:
" Of the treaſure took by Drake,
" Reſtitution you muſt make:
" And thoſe abbeys build anew,
" Which your father overthrew:
" If for any peace you hope,
" In all points reſtore the pope."

The queen's extempore return:

*Ad Græcas, bone rex, fient mandata kalendas.*

" Worthy king, know, this your will
" At Latter-Lammas we'll fulfil.

In the year 1589, Sir Francis Drake commanded as admiral the fleet ſent to reſtore Don Antonio king of Portugal, the command of the land-forces being given to Sir John Norris: but they were hardly got to ſea, before the commanders differed, and ſo the attempt proved abortive. The war with Spain continuing, a more effectual expedition was undertaken by Sir John Hawkins and Sir Francis Drake, againſt their ſettlements in the Weſt Indies, than had hitherto been made during the whole courſe of it: but the commanders here again not agreeing about the plan, this alſo did not turn out ſo ſucceſsfully as was expected. All difficulties, before theſe two laſt expeditions, had given way to the ſkill and fortune of Sir Francis Drake; which probably was the reaſon why he did not bear theſe diſappointments ſo well as he otherwiſe would have done. A ſtrong ſenſe of them is ſuppoſed to have thrown him into a melancholy, which occaſioned a bloody flux; and of this he died on board his own ſhip, near the town of Nombre de Dios in the Weſt Indies, on the 28th of January 1595-6. His death was lamented by the whole nation, and particularly by his countrymen; who had great reaſon to love him from the circumſtances of his private life, as well as to eſteem him in his public character. He was elected burgeſs for the town of Boſſiney, alias Tintagal, in the county of Cornwall, in the 27th parliament of queen Elizabeth; and for Plymouth in Devonſhire, in the 35th of the ſame reign. This town had very particular obligations to him: for, in the year 1587, he undertook to bring water into it, through the want of which, till then, it had been grievouſly diſtreſſed; and he performed it by conducting thither a ſtream from ſprings at eight miles diſtance, that is to ſay, in a ſtraight line: for in the manner he brought it, the courſe of it runs upwards of 20 miles.

DRAKENBORCH (Arnold), profeſſor of eloquence and hiſtory at Utrecht, made himſelf known by ſeveral works, and particularly by his Notes on Titus Livius and Silius Italicus; his fine editions of which are highly eſteemed.

DRAMA, a poem containing ſome certain action, and repreſenting a true picture of human life, for the delight and improvement of mankind.

The principal ſpecies of the drama are two, comedy and tragedy. Some others there are of leſs note, as paſtoral, ſatire, tragi-comedy, opera, &c. See the article Poetry.

DRAMATIC, an epithet given to pieces written for the ſtage. See Poetry.

DRANK, among farmers, a term uſed to denote wild oats, which never fail to infeſt worn-out lands; ſo that, when ploughed lands run to theſe weeds and thiſtles, the farmer knows it is high time to fallow them, or elſe to ſow them with hay-ſeed, and make paſture of them.

DRAPERY, in ſculpture and painting, ſignifies the repreſentation of the clothing of human figures, and alſo hangings, tapeſtry, curtains, and moſt other things that are not carnations or landſcapes. See PAINTING, CRAYON, DRAWING, and MINIATURE.

DRASTIC, in phyſic, an epithet beſtowed on ſuch medicines as are of preſent efficacy, and potent in operation; and is commonly applied to emetics and cathartics.

DRAVE, a large navigable river, which, taking its riſe in the archbiſhopric of Saltzburg, in Germany, runs ſouth-eaſt through Stiria; and continuing its courſe, divides Hungary from Sclavonia, and fall into the Danube at Eſſeck.

DRAUGHT, in medicine. See POTION.

DRAUGHT, in trade, called alſo *cloff* or *clouch*, is a ſmall allowance on weighable goods, made by the king to the importer, or by the ſeller to the buyer, that the weight may hold out when the goods are weighed again.

The king allows 1 ℔ draught for goods weighing no leſs than 1 Cwt 2 ℔ for goods weighing between 1 and 2 Cwt. 3 ℔ for goods weighing between 2 and 3 Cwt. 4 ℔ from 3 to 10 Cwt. 7 ℔ from 10 to 18 Cwt. 9 ℔ from 18 to 30 or upwards

DRAUGHT is alſo uſed ſometimes for a bill of exchange, and commonly for an order for the payment of any ſum of money due, &c. Then the perſon who gives the order is ſaid to draw upon the other.

DRAUGHT, or, as it is pronounced, DRAFT, in architecture, the figure of an intended building deſcribed on paper; wherein are laid down, by ſcale and compaſs, the ſeveral diviſions and partitions of the apartments, rooms, doors, paſſages, conveniencies, &c. in their due proportion.

It is uſual, and exceedingly convenient, before a building is begun to be raiſed, to have draughts of the ichnography, or ground-plot of each floor or ſtory; as alſo of the form and faſhion of each front, with the windows, doors, ornaments, &c. in an orthography, or upright. Sometimes the ſeveral fronts, &c. are taken, and repreſented in the ſame draught, to ſhow the effect of the whole building: this is called a *ſcenography*, or *perſpective*.

DRAUGHT, the depth of a body of water neceſſary to float a ſhip: hence a ſhip is ſaid to draw ſo many feet of water, when ſhe is borne up by a column of water of that particular depth. Thus, if it requires a body of water whoſe depth is equal to 12 feet, to float or buoy up a ſhip on its ſurface, ſhe is ſaid to draw 12 feet water; and that this draught may be more readily known, the feet are marked on the ſtem and ſtern poſt, regularly from the keel upwards.

*DRAUGHT-Hooks*, are large hooks of iron, fixed on the cheeks of a cannon-carriage, two on each ſide, one near the trunnion hole, and the other at the train, diſtinguiſhed by the name of *fore* and *hind draught-hooks*. Large guns have draught-hooks near the middle tranſom, to which are fixed the chains that ſerve to keep the ſhafts of the limbers on a march. The fore and hind hooks are uſed for drawing a gun backwards or forwards, by men with ſtrong ropes, called *draught-ropes*, fixed to theſe hooks.

*DRAUGHT-Horſe*, in farming, a ſort of coarſe-made horſe, deſtined for the ſervice of a cart or plough.

DRAWBACK, in commerce, certain duties, either of the cuſtoms or of the exciſe, allowed upon the exportation of ſome of our own manufactures; or upon certain foreign merchandiſe, that have paid duty on importation.

The oaths of the merchants importing and exporting are required to obtain the drawback on foreign goods, affirming the truth of the officers certificate on the entry, and the due payment of the duties: and theſe may be made by the agent or huſband of any corporation or company; or by the known ſervant of any merchant uſually employed in making his entries, and paying his cuſtoms. In regard to foreign goods entered outward, if leſs quantity or value be fraudulently ſhipped out than what is expreſſed in the exporter's certificate, the goods therein mentioned, or their value, are forfeited, and no drawback to be allowed for the ſame. Foreign goods exported by certificate in order to obtain the drawback, not ſhipped or exported, or relanded in Great Britain, unleſs in caſe of diſtreſs to ſave them from periſhing, are to loſe the benefit of the drawback, and are forfeited, or their value, with the veſſel, horſes, carriages, &c. employed in the relanding thereof; and the perſons employed in the relanding them, or by whoſe privity they are relanded, or into whoſe hands they ſhall knowingly come, are to forfeit double the amount of the drawback. Officers of the cuſtoms conniving at or aſſiſting in any fraud relating to certificate goods, beſides other penalties, are to forfeit their office, and ſuffer ſix months impriſonment without bail or mainprize; as are alſo maſters, or perſons belonging to the ſhips employed therein. Bonds given for the exportation of certificate-goods to Ireland muſt not be delivered up, nor drawback allowed for any goods, till a certificate under the hands and ſeals of the collector or comptroller, &c. of the cuſtoms be produced, teſtifying the landing.

*DRAW-Bridge*, a bridge made after the manner of a float, to draw up or let down, as occaſions ſerve, before the gate of a town or caſtle. See BRIDGE.

A draw-bridge may be made after ſeveral different ways; but the moſt common are made with plyers, twice the length of the gate, and a foot in diameter. The inner ſquare is traverſed with a croſs, which ſerves for a counterpoiſe; and the chains which hang from the extremities of the plyers to lift up or let down the bridge, are of iron or braſs.

In navigable rivers it is ſometimes neceſſary to make the middle arch of bridges with two moveable platforms, to be raiſed occaſionally, in order to let the maſts and rigging of ſhips paſs through. This kind of draw-bridge is repreſented in Plate CLXV. where A B is the width of the middle arch; A L and B L, the two piers that ſupport the draw-bridge N O, one of the platforms of which is raiſed, and the other let down, having the beam P Q for its plyer. To N O are ſuſpended two moveable braces E H, E H; which reſting on the ſupport E, preſs againſt the bracket M, and thereby ſtrengthen the draw-bridge. Theſe braces are conducted to the reſt by means of the weight S, pulling the chain S L F.

*DRAW-Net*, a kind of net for taking the larger ſort of wildfowl, which ought to be made of the beſt ſort of pack-thread, with wide meſhes; they ſhould be about two fathoms deep and ſix long, verged on each ſide with a very ſtrong cord, and ſtretched at each end on long poles. It ſhould be ſpread ſmooth and flat upon the ground; and ſtrewed over with graſs, ſedge, or net

or the like, to hide it from the fowl; and the ſportſman is to place himſelf in ſome ſhelter of graſs, fern, or ſome ſuch thing.

Drawing.

DRAWING, in general, denotes the action of pulling out, or hauling along; thus we read of tooth-drawing, wire-drawing, &c.

# DRAWING,

THE art of repreſenting the appearances of objects upon a plain ſurface, by means of lines, ſhades, and ſhadows, formed with certain materials adapted to the purpoſe.

### § 1. *Of the proper Materials for Drawing, and the Manner of uſing them.*

THE firſt thing neceſſary for a beginner is to furniſh himſelf with proper materials, ſuch as black-lead pencils, crayons of black, white, or red chalk, crow-quill pens, a rule and compaſſes, camels-hair pencils, and Indian ink. He muſt accuſtom himſelf to hold the pencil farther from the point than one does a pen in writing; which will give him a better command of it, and contribute to render the ſtrokes more free and bold. The uſe of the pencil is to draw the firſt ſketches or outlines of the piece, as any ſtroke or line that is amiſs may in this be more eaſily rubbed out than in any other thing; and when he has made the ſketch as correct as he can with the pencil, he may then draw carefully the beſt outline he has got, with his crow-quill pen and ink (A); after which he may diſcharge the pencil-lines, by rubbing the piece gently with the crumb of ſtale bread or India rubber. Having thus got the outline clear, his next work is to ſhade the piece properly, either by drawing fine ſtrokes with his pen where it requires to be ſhaded, or by waſhing it with his pencil and the Indian ink. As to his rule and compaſſes, they are never or very rarely to be uſed, except in meaſuring the proportions of figures after he has drawn them, to prove whether they are right or not; or in houſes, fortifications, and other pieces of architecture.

### § 2. *Of drawing Lines, Squares, Circles, and other regular and irregular Figures.*

HAVING got all theſe implements in readineſs, the firſt practice muſt be to draw ſtraight and curve lines, with eaſe and freedom, upwards and downwards, ſideways to the right or left, or in any direction whatſoever. He muſt alſo learn to draw, by command of hand, ſquares, circles, ovals, and other geometrical figures: for as the alphabet, or a knowledge of the letters, is an introduction to grammar; ſo is geometry to drawing. The practice of drawing theſe ſimple figures till he is maſter of them, will enable him to imitate, with greater eaſe and accuracy, many things both in nature and art. And here it is proper to admoniſh him, never to be in a hurry; but to make himſelf perfectly maſter of one figure before he proceeds to another: the advantage, and even neceſſity, of this, will appear as he proceeds. Two obſervations more may be added: 1. That he accuſtom himſelf to draw all his figures very large, which is the only way of acquiring a free bold manner of deſigning. 2. That he practiſe drawing till he has gained a tolerable maſter of his pencil, before he attempts to ſhadow any figure or object of any kind whatever.

### § 3. *Of Drawing Eyes, Ears, Legs, Arms, Hands, Feet, &c.*

As to the drawing of eyes and ears, legs and arms, the learner will have very little more to do than to copy carefully the examples given in Plate CLXVI. and CLXVII. taken from Sebaſtian le Clerc's drawing book. But the actions and poſtures of the hands are ſo many and various, that no certain rules can be given for drawing them, that will univerſally hold good. Yet as the hands and feet are difficult members to draw, it is very neceſſary, and well worth while, to beſtow ſome time and pains about them, carefully imitating their various poſtures and actions, ſo as not only to avoid all lameneſs and imperfection, but alſo to give them life and ſpirit. To arrive at this, great care, ſtudy, and practice, are requiſite; particularly in imitating the beſt prints or drawings that can be got of hands and feet (ſome good examples of which are given in Plate CLXVII.); for, as to the mechanical rules of drawing them by lines and meaſures, they are not only perplexed and difficult, but alſo contrary to the practice of the beſt maſters. One general rule, however, may be given (which is univerſally to be obſerved in all ſubjects), and that is, Not to finiſh perfectly at firſt any ſingle part, but to ſketch out faintly, and with light ſtrokes of the pencil, the ſhape and proportion of the whole hand, with the action and turn of it; and after conſidering carefully whether this firſt ſketch be perfect, and altering it wherever it is amiſs, you may then proceed to the beading of the joints, the knuckles, the veins, and other ſmall particulars, which when the learner has got the whole ſhape and proportion of the hand or foot, will not only be more eaſily but alſo more perfectly deſigned.

### § 4. *Of Drawing Faces.*

THE head is uſually divided into four equal parts. (1.) From the crown of the head to the top of the forehead. (2.) From the top of the forehead to the eye-brows. (3.) From the eye-brows to the bottom of the noſe. (4.) From thence to the bottom of the chin. But this proportion is not conſtant; thoſe features in different men being often very different as to length and ſhape. In a well-proportioned face, however, they are nearly right. To direct the learner therefore in forming a perfect face, his firſt buſineſs is to draw an oval, or rather the form of an egg; in the middle

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(A) The ink made uſe of for this purpoſe muſt not be common, but Indian-ink; which is much ſofter than the other, and does not run: by mixing it with water, it may be made to any degree of ſtrength, and uſed in a pen like common ink.

middle of which, from the top to the bottom, draw a perpendicular line. Through the centre or middle of this line draw a diameter line, directly acroſs from one ſide to the other of your oval. On theſe two lines all the features of your face are to be placed as follows: Divide your perpendicular line into four equal parts: the firſt muſt be allotted to the hair of the head; the ſecond is from the top of the forehead to the top of the noſe between the eye-brows; the third is from thence to the bottom of the noſe; and the fourth includes the lips and chin. Your diameter line, or the breadth of the face, is always ſuppoſed to be the length of five eyes; you muſt therefore divide it into five equal parts, and place the eyes upon it ſo as to leave exactly the length of one eye betwixt them. This is to be underſtood only of a full front face, Plate CLXVI. fig. *a*; for if it turn to either ſide, then the diſtances are to be leſſened on that ſide which turns from you, leſs or more in proportion to its turning, (fig. *b b b*.) The top of the ear is to riſe parallel to the eye-brows, at the end of the diameter line; and the bottom of it muſt be equal to the bottom of the noſe. The noſtrils ought not to come out farther than the corner of the eye in any face; and the middle of the mouth muſt always be placed upon the perpendicular line.

### § 5. *Of Drawing Human Figures.*

WHEN the learner is tolerably perfect in drawing faces, heads, hands, and feet, he may next attempt to draw the human figure at length. In order to which, let him firſt ſketch the head; then draw a perpendicular line from the bottom of the head ſeven times its length (for the length of the head is about one-eighth part of the length of the figure).

The beſt proportioned figures of the ancients are $7\frac{3}{4}$ heads in height. If, therefore, the figure ſtands upright, as fig. (*a*, Plate CLXVIII.) draw a perpendicular line from the top of the head to the heel, which muſt be divided into two equal parts. The bottom of the belly is exactly the centre. Divide the lower part into two equal parts again, the middle of which is the middle of the knee. For the upper part of the figure, the method muſt be varied. Take off with your compaſſes the length of the face (which is three parts in 4 of the length of the head); from the throat-pit to the pit of the ſtomach is one face, from thence to the navel is another, and from thence to the lower rim of the belly is a third. The line muſt be divided into ſeven equal parts. Againſt the end of the firſt diviſion, place the breaſts; the ſecond comes down to the navel; the third to the privities; the fourth to the middle of the thigh; the fifth to the lower part of the knee; the ſixth to the lower part of the calf; and the ſeventh to the bottom of the heel, the heel of the bearing leg being always exactly under the pit of the throat. But as the eſſence of all drawing conſiſts in making at firſt a good ſketch, the learner muſt in this particular be very careful and accurate; he ought to draw no one part perfect or exact till he ſee whether the whole draught be good; and when he has altered that to his mind, he may then finiſh one part after another as curiouſly as he can.

There are ſome who, having a ſtatue to copy, begin with the head, which they finiſh, and then proceed in the ſame manner to the other parts of the body, finiſhing as they go: but this method generally ſucceeds ill; for if they make the head in the leaſt too big or too little, the conſequence is a diſproportion between all the parts, occaſioned by their not having ſketched the whole proportionably at firſt. Let the learner remember, therefore, in whatever he intends to draw, firſt to ſketch its ſeveral parts, meaſuring the diſtances and proportions between each with his finger or pencil, without uſing the compaſſes; and then judge of them by the eye, which by degrees will be able to judge of truth and proportion, and will become his beſt and principal guide. And let him obſerve, as a general rule, Always to begin with the right ſide of the piece he is copying: for by that means he will always have what he has done before his eyes; and the reſt will follow more naturally, and with greater eaſe: whereas if he begin with the left ſide, his hand and arm will cover what he does firſt, and deprive him of the ſight of it; by which means he will not be able to proceed with ſo much eaſe, pleaſure, or certainty.

As to the order and manner of proceeding in drawing the human body, he muſt firſt ſketch the head; then the ſhoulders in the exact breadth; then draw the trunk of the body, beginning with the arm-pits (leaving the arms till afterwards), and ſo draw down to the hips on both ſides; and be ſure he obſerve the exact breadth of the waiſt. When he has done this, let him then draw that leg which the body ſtands upon, and afterwards the other which ſtands looſe; then the arms, and laſt of all the hands.

He muſt take notice alſo of the bowings and bendings that are in the body; making the part which is oppoſite to that which bends correſpond to it in bending with it. For inſtance: If one ſide of the body bend in, the other muſt ſtand out anſwerable to it; if the back bend in, the belly muſt ſtick out; if the knee bend out, the ham muſt fall in; and ſo of any other joint in the body. Finally, he muſt endeavour to form all the parts of the figure with truth, and in juſt proportion: not one arm or one leg bigger or leſs than the other; not broad Herculean ſhoulders, with a thin and ſlender waiſt; nor raw and bony arms, with thick and gouty legs: but let there be a kind of harmonious agreement amongſt the members, and a beautiful ſymmetry throughout the whole figure.

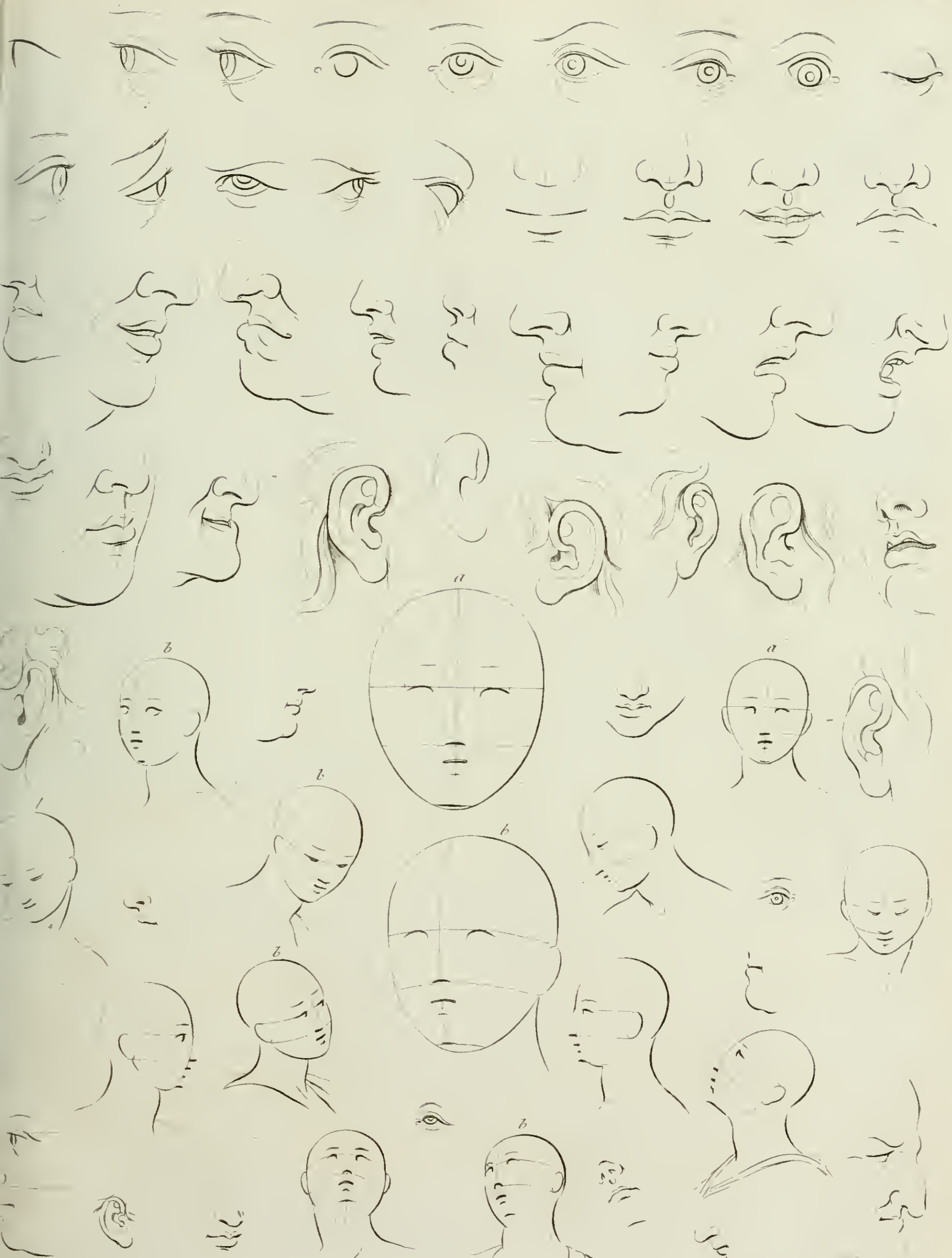
*Proportions and Meaſures of the Human Body.* The centre or middle part, between the two extremes of the head and feet of a new born child, is in the navel, but that of an adult is in the os pubis; and the practice of dividing the meaſures of children into four, five, or ſix parts, whereof the head is one, is made uſe of by painters and ſculptors.

A child of two years old has about five heads in its whole length, but one of four or five years old has near ſix; about the fifteenth or ſixteenth year, ſeven heads are the proportion or meaſure, and the centre inclines to the upper part of the pubis. Hence it appears, as the growth of the body advances, there is a gradual approach to the proportion of an adult of near eight heads in the whole length, of which, as mentioned above, the head makes one.

Agreeable to theſe principles, the following Table is conſtructed, exhibiting the proportions of the parts of a man and of a woman, as they were fixed by the ancients, and meaſured by M. Audran from the Apollo

# DRAWING.

Plate CLXVI.



*A. Bell Prin. Wal. Sculptor fecit.*

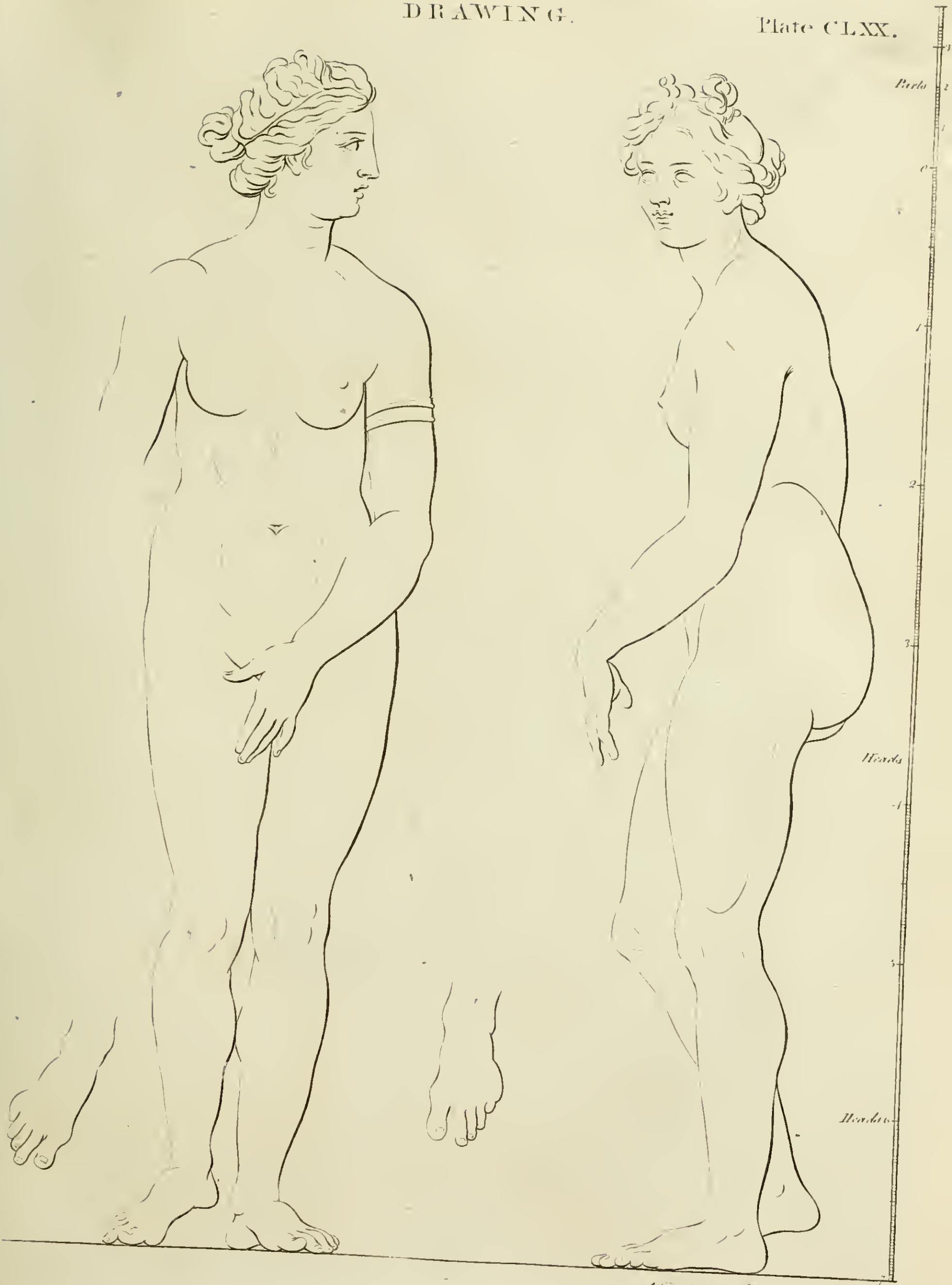
A. Bell Prin. Wal. Sculptor fecit.

DRAWNIG. Pl. CLXVIII.

*A. Bell Prin. Wal. Sculptor fecit.*

DRAWING. Plate CLXIX.

A. Bell Prin. Wal. Sculptor fecit.



A. Bell Prin. Wal. Sculptor fecit.

pollo Pythius (Plate CLXIX.) in the garden of the Vatican at Rome, and the Venus Aphroditus (Plate CLXX.) belonging to the family of the Medicis. Suppoſing the figures to ſtand upright and duly poiſed on both legs, the whole height of the former is divided into 31½ parts, being 7 heads 3 parts and 6 minutes; and that of the latter into 31 parts, being 7 heads and 3 parts.

| | Apollo. | | | Venus. | | |
|---|---|---|---|---|---|---|
| | Hds | Pts. | Min | Hds. | Pts. | Min. |
| *Length of the Head and Trunk of the Body.* | | | | | | |
| From the top of the head to the bottom of the chin 4 parts or | 1 | 0 | 0 | 1 | 0 | 0 |
| the bottom of the chin to the top of the ſternum or breaſt-bone | 0 | 1 | 7 | 0 | 1 | 8 |
| the top of the ſternum to the pit of the ſtomach | 0 | 3 | 10 | 0 | 3 | 6 |
| the pit of the ſtomach to the navel | 0 | 2 | 10 | 0 | 2 | 7 |
| the navel to the pubis | 0 | 3 | 6 | 0 | 3 | 9 |
| Length of the head and trunk of the body | 3 | 3 | 9 | 3 | 3 | 6 |
| *Length of the Lower Extremities.* | | | | | | |
| From the pubis to the ſmall of the thigh above the patella or knee-pan | 1 | 2 | 6 | 1 | 2 | 3 |
| the ſmall of the thigh to the joint or middle of the knee | 0 | 1 | 9 | 0 | 1 | 6 |
| the joint of the knee to the ſmall of the leg above the ankle | 1 | 1 | 9 | 1 | 2 | 0 |
| the top to the bottom of the ankle | 0 | 1 | 0 | 0 | 1 | 0 |
| the bottom of the ankle to the bottom of the heel | 0 | 0 | 9 | 0 | 0 | 9 |
| Length of the lower extremities | 3 | 3 | 9 | 3 | 3 | 6 |
| Length of the head and trunk, as above | 3 | 3 | 9 | 3 | 3 | 6 |
| Total length of the figures | 7 | 3 | 6 | 7 | 3 | 0 |
| *Length of the Fore-Arm or Upper Extremities.* | | | | | | |
| From the top of the ſhoulder to the elbow | 1 | 2 | 3 | 1 | 2 | 3 |
| the elbow to the hand | 1 | 1 | 2 | 1 | 0 | 6 |
| the joint of the hand to the root of the middle finger | 0 | 1 | 8 | 0 | 1 | 6 |
| the root to the tip of the middle finger | 0 | 1 | 10 | 0 | 1 | 7 |
| Length of the upper extremities | 3 | 2 | 11 | 3 | 1 | 10 |
| Breadth between the outward angles of the eyes | 0 | 1 | 6 | 0 | 1 | 7 |
| of the face at the temples | 0 | 2 | 2 | 0 | 2 | 2 |
| of the upper part of the neck | 0 | 2 | 0 | 0 | 1 | 11 |
| over the ſhoulders | 2 | 0 | 0 | 1 | 3 | 8 |
| of the body below the arm-pits | 1 | 2 | 5 | 1 | 1 | 8 |
| between the nipples | 1 | 0 | 7 | 0 | 3 | 8 |
| from the bottom of the chin to the horizontal line of the nipples | 1 | 0 | 7 | 1 | 0 | 1 |
| of the body at the ſmall of the waiſt | 1 | 1 | 0 | 1 | 0 | 8 |
| over the loins or os ilium | 1 | 1 | 3 | 1 | 1 | 6 |
| over the haunches or tops of the thigh-bones | 1 | 1 | 5 | 1 | 2 | 3 |
| of the thigh at the top | 0 | 3 | 0 | 0 | 3 | 1 |
| of the thigh below the middle | 0 | 2 | 8½ | 0 | 2 | 7 |
| of the thigh above the knee | 0 | 1 | 8 | 0 | 2 | 0 |
| of the leg below the knee | 0 | 1 | 6 | 0 | 1 | 10½ |
| at the calf of the leg | 0 | 2 | 4 | 0 | 2 | 3 |
| below the calf | 0 | 1 | 7 | 0 | 1 | 11½ |
| above the ankle | 0 | 1 | 2 | 0 | 1 | 2 |
| of the ankle | 0 | 1 | 4 | 0 | 1 | 3 |
| below the ankle | 0 | 1 | 1½ | 0 | 1 | 1 |
| middle of the foot | 0 | 1 | 4 | 0 | 1 | 3 |
| at the roots of the toes | 0 | 1 | 7 | 0 | 1 | 7 |
| of the arm over the biceps muſcle | 0 | 1 | 8 | 0 | 1 | 9 |
| of the arm above the elbow | 0 | 1 | 6 | 0 | 1 | 5 |
| of the arm below the elbow over the long ſupinator | 0 | 1 | 10 | 0 | 1 | 7 |
| at the wriſt | 0 | 1 | 1 | 0 | 1 | 0 |
| of the hand over the firſt joint of the thumb | 0 | 1 | 9 | 0 | 1 | 8 |
| of the hand over the roots of the fingers | 0 | 1 | 7 | 0 | 1 | 6 |

| | *Apollo.* | | | *Venus.* | | |
|---|---|---|---|---|---|---|
| | Hds. | Pts. | Min. | Hds. | Pts. | Min. |
| Breadth over the heads of the ſcapulæ or ſhoulder blades - | 1 | 2 | 0 | 1 | 1 | 4 |
| Length of both arms and hands, each of the Apollos being 3h. 2p. 11m. and the Venus 3h. 1p. 5m. - - | 7 | 1 | 10 | 6 | 2 | 10 |
| Breadth betwixt the tips of the middle fingers of each hand when the arms are ſtretched out horizontally - - | 8 | 3 | 10 | 8 | 0 | 2 |
| *Side View.* | | | | | | |
| Length from the top of the head to the ſhoulder - - | 1 | 1 | 8 | 1 | 1 | 6 |
| from the top of the ſhoulder to the loins above the hip - | 1 | 3 | 3 | 1 | 1 | 7 |
| from the loins to the lower part of the hip - | 1 | 0 | 2 | 1 | 2 | 1 |
| from the hip to the ſide of the knee, oppoſite to the top of the patella | 1 | 2 | 0 | 1 | 0 | 11 |
| from the ſide of the knee to the bottom of the heel - | 2 | 0 | 5 | 2 | 0 | 11 |
| Length of the figures - - | 7 | 3 | 6 | 7 | 3 | 0 |
| *Side View.* | | | | | | |
| Thickneſs from the fore to the back part of the ſkull - | 0 | 3 | 6 | 0 | 3 | 4 |
| from the wing of the noſe to the tip of the ear - | 0 | 1 | 8½ | 0 | 1 | 6 |
| of the upper part of the neck - - | 0 | 2 | 0 | 0 | 1 | 11 |
| from the breaſt to the back over the nipples - | 1 | 0 | 6 | 1 | 0 | 6 |
| from the belly to the ſmall of the back - - | 0 | 3 | 6 | 0 | 3 | 7 |
| from the belly above the navel to the back of the loins - | 0 | 3 | 9 | 1 | 0 | 2 |
| from the bottom of the belly to the round of the hip - | 1 | 0 | 0 | 1 | 0 | 5 |
| from the fore-part of the thigh to the bottom of the hip - | 0 | 3 | 2 | 0 | 3 | 7 |
| of the thigh at the middle - - | 0 | 3 | 3 | 0 | 3 | 6½ |
| of the thigh above the knee - - | 0 | 2 | 1 | 0 | 2 | 3 |
| at the middle of the knee below the patella - | 0 | 2 | 1 | 0 | 2 | 2 |
| of the leg below the knee - - | 0 | 1 | 9 | 0 | 1 | 11 |
| of the leg at the calf - - - | 0 | 1 | 8 | 0 | 1 | 9 |
| of the leg at the ankle - - - | 0 | 1 | 5½ | 0 | 1 | 4 |
| of the foot at the thickeſt part - - | 0 | 0 | 0 | 0 | 1 | 3 |
| length of the foot - - - | 1 | 0 | 6 | 1 | 0 | 4½ |
| from the fore-part of the bend of the foot to the lower and back part of the heel - - - | 0 | 0 | 0 | 0 | 2 | 2 |
| of the arm over the biceps - - | 0 | 2 | 0 | 0 | 1 | 9 |
| over the elbow - - | 0 | 1 | 6 | 0 | 1 | 6 |
| below the elbow - - | 0 | 1 | 5 | 0 | 1 | 7 |
| at the wriſt - - | 0 | 1 | 1 | 0 | 0 | 11 |
| below the joint of the wriſt - | 0 | 1 | 0 | 0 | 0 | 10 |
| of the hand at the roots of the fingers - - | 0 | 0 | 5½ | 0 | 0 | 5 |
| at the roots of the nails - - | 0 | 0 | 3½ | 0 | 0 | 3 |

The other moſt admired antique ſtatues differ a little from theſe proportions, the Laocoon meaſuring 7h. 2p. 3m. the Hercules 7h. 3p. 7m. the Pyramus 7h. 2p. the Antinous 7h. 2p. the Grecian ſhepherdeſs 7h. 3p. 6m. and the Mirmillo 8h. But all their other proportions are allowed to be harmonious and agreeable to the characters of the figures they repreſent.

The moſt remarkable differences of the ſymmetry or proportions of a man and of a woman to be obſerved from the Table are: Firſt, the ſhoulders of a man are broader, meaſuring two heads; and the haunches narrower, meaſuring 1h. 1p. 5m. whereas the ſhoulders of a woman meaſure only 1h. 3p. 8m. and the haunches meaſure 1h. 2p. 3m. The ſternum or breaſt bone of a man is longer, meaſuring 3p. 8m. and the ſternum of the woman only 3p. 3m. On the contrary, the pelvis of a man is leſs, meaſuring from the top to the bottom only 4 p. whereas the pelvis of a woman meaſures from the top to the bottom 4p. 3m.

It is a leading principle, in which every perſon converſant in deſigning has agreed, that without a perfect knowledge of the proportions, nothing can be produced but monſtrous and extravagant figures; and it is alſo univerſally admitted, that the ancient Greek and Roman ſculptors attained the higheſt ſucceſs in producing the moſt perfect models.

The greateſt of the modern artiſts who have examined their figures with attention admit, that ſeveral of the ancient ſculptors in ſome degree have excelled nature, they never having found any man ſo perfect in all his parts as ſome of their figures are. Their opportunities indeed were great; Greece abounded with beauties; and Rome being miſtreſs of the world, every thing that was curious and beautiful was brought to it from all parts. Their motives were alſo powerful; religion, glory, and intereſt. They conſidered it as a kind

kind of religious worſhip to give the figures of their gods ſo much nobleneſs and beauty as to be able to attract the love and veneration of the people. Their own glory was alſo concerned, particular honours being beſtowed on thoſe who ſucceeded; and for their fortune they had no further care to take when they once arrived at a certain degree of merit.

*Attitudes and Action of the Muſcles.* If a ſtrong perſon is to be repreſented in a vigorous action, ſuch as Hercules, &c. after a ſuitable proportion to ſuch a figure and the action is deſigned, the parts or limbs employed in the chiefeſt force of the action ought to be conſidered. If the figure is ſtanding, the foot muſt be placed in a right line, or perpendicular to the trunk or bulk of the body, where the centre of gravity may be placed *in æquilibrio*. This centre is determined by the heel; or, if the figure is upon tiptoe, then the ball of the great toe is in the centre. The muſcles of the leg which ſupports the body ought to be ſwelled, and their tendons drawn more to an extenſion than thoſe of the other leg, which is only placed ſo as to receive the weight of the body towards that way to which the action inclines it. For example, ſuppoſe Hercules with a club ſtriking at any thing before him towards the left ſide: Then let his right leg be placed ſo as to receive the whole weight of the body, and the left looſely touching the ground with its toes. Here the external muſcles of the right leg ought to be expreſſed very ſtrong; but thoſe of the left ſcarcely appearing more than if it were in ſome ſedentary poſture, except in the preſent caſe. The foot being extended, the muſcles which compoſe the calf of the leg are in action and appear very ſtrong; though it is not meant that *all* the muſcles of the right leg, which ſupports the weight of the body, ought to be expreſſed very ſtrong or equally ſwelled, but thoſe moſt tumified which are chiefly concerned in the action or poſture that the leg is then in. For example, if the leg or tibia is extended, then the extending muſcles placed on the thigh are moſt ſwelled: if it is bended, then the bending muſcles and their tendons appear moſt The like may be obſerved of the whole body in general when it is put into vigorous action. The Laocoon in the Vatican garden at Rome furniſhes an example of this muſcular appearance through the whole; but in the Antinous, Apollo, and other figures of the ancients, in the Vatican and other places, in poſtures where no conſiderable actions are deſigned, we ſee their muſcles expreſſed but faintly, or ſcarcely appearing.

The clavicles or collar bones, and muſcles in general, do not appear in women as in men; nor will any action in which a woman uſes her utmoſt ſtrength occaſion ſuch ſwellings or riſings of the muſcles to appear as they do in men, ſince the great quantity of fat placed under the ſkin of women ſo clothes their muſcles, &c. as to prevent any ſuch appearances.

*Effects of the Exertion of the Muſcles.* The following are the moſt obvious effects of the exertion of ſeveral of the muſcles; of thoſe, to wit, which chiefly demand the attention of an artiſt.

If either of the maſtoid muſcles (Plate CLXXI. 1. 1.) act, the head is turned to the contrary ſide, and the muſcle which performs that action appears very plain under the ſkin.

If the arms are lifted up, the deltoid muſcles placed on the ſhoulders, which perform that action, ſwell, and make the extremities of the ſpines of the ſhoulder-blades (Plate CLXXII. 3. 3.), called the tops of the ſhoulders, appear indented or hollow.

The ſhoulder-blades following the elevation of the arms, their baſes (Plate CLXXII. 4. 4.) incline at that time obliquely downward.

If the arms are drawn down, put forwards, or pulled backwards, the ſhoulder-blades neceſſarily vary their poſitions accordingly. All theſe particulars are to be learned by conſulting the life only: when being well acquainted with what then appears in every action, the artiſt will be able to form an adequate idea how it ought to be expreſſed. Theſe circumſtances are little known; hence ſeldom attended to in deſigning.

When the cubit or fore-arm is bended, the biceps (Plate CLXXI. 5. 5.) has its belly very much raiſed, as appears in the left arm. The like may be obſerved of the triceps (Plate CLXXII. 6. 6.) when the arm is extended, as obſerved in the right arm.

The ſtraight muſcles of the abdomen (Plate CLXXI. 7. 7.) appear very ſtrong when riſing from a decumbent poſture.

Thoſe parts of the great ſerratus muſcle (ib. 8. 8.) which are received in the teeth or beginnings of the oblique deſcending muſcle immediately below, are very much ſwelled when the ſhoulder on the ſame ſide is brought forwards; that ſerratus muſcle then being in action in drawing the ſcapula forwards.

The long extending muſcles of the trunk (Plate CLXXII. 9. 9.) act alternately in walking, after this manner: If the right leg bears the weight of the body, and the left is in tranſlation as on tiptoe, the laſt mentioned muſcles of the back on the left ſide may be obſerved to be tumified on the other ſide about the region of the loins, and ſo on the other ſide.

The trochanters, or outward and uppermoſt heads of the thigh-bones (Plate CLXXII. 10. 10.), vary in their poſitions in ſuch a manner as no preciſe obſervations can explain their ſeveral appearances; but the ſtudy after the life ought to be carefully attended to.

If the thigh is extended, as when the whole weight of the body reſts on that ſide, the gluteus or buttock muſcle (Plate CLXXII. 11. 11.) makes a very different appearance from what offers at another time; but if the thigh is drawn backwards, that muſcle appears ſtill more and more tumified.

When the whole leg is drawn upwards forwards, and at the ſame time the foot is inclined inwards, the upper part of the ſartorius muſcle (Plate CLXXI. 12. 12.) appears riſing very ſtrong; in other poſitions of the thigh, that muſcle makes a furrowing appearance in its whole progreſs.

If a man is upon tiptoe, the extending muſcles of the leg placed on the fore-part of the thigh (Plate CLXXI. 13. 13. 13.), and thoſe of the foot that compoſe the calf of the leg (Plate CLXXII. 14. 14.), appear very ſtrong, and the long peronæus (Plate CLXXI. 15.) makes a conſiderable indentation or furrowing at that time in its progreſs on the outſide of the leg.

Many other remarks might here be offered; but a due attention to nature will ſoon diſcover them.

### § 6. *Of Light and Shade.*

After the learner has made himſelf in ſome meaſure perfect in drawing outlines, his next endeavour muſt be to ſhade them properly. It is this which gives an appearance of ſubſtance, ſhape, diſtance, and diſtinction, to whatever bodies he endeavours to repreſent, whether animate or inanimate. The beſt rule for doing this is, to conſider from what point, and in what direction, the light falls upon the objects which he is delineating, and to let all his lights and ſhades be placed according to that direction throughout the whole work. That part of the object muſt be lighteſt which hath the light moſt directly oppoſite to it; if the light falls ſideways on the picture, he muſt make that ſide which is oppoſite to it lighteſt, and that ſide which is fartheſt from it darkeſt. If he is drawing the figure of a man, and the light be placed above the head, then the top of the head muſt be made lighteſt, the ſhoulders next lighteſt, and the lower parts darker by degrees. That part of the object, whether in naked figures, or drapery, or buildings, that ſtands fartheſt out, muſt be made the lighteſt, becauſe it comes neareſt to the light; and the light loſeth ſo much of its brightneſs, by how much any part of the body bends inward, becauſe thoſe parts that ſtick out hinder the luſtre and full brightneſs of the light from ſtriking on thoſe parts that fall in. Titian uſed to ſay, that he knew no better rule for the diſtribution of lights and ſhadows than his obſervations drawn from a bunch of grapes. Sattins and ſilks, and all other ſhining ſtuffs, have certain glancing reflections, exceeding bright where the light falls ſtrongeſt. The like is ſeen in armour, braſs pots, or any other glittering metal, where you ſee a ſudden brightneſs in the middle or centre of the light, which diſcovers the ſhining nature of ſuch things. Obſerve alſo, that a ſtrong light requires a ſtrong ſhade, a fainter light a fainter ſhade; and that an equal balance be preſerved throughout the piece between the lights and ſhades. Thoſe parts which muſt appear round require but one ſtroke in ſhading, and that ſometimes but very faint; ſuch parts as ſhould appear ſteep or hollow, require two ſtrokes acroſs each other, or ſometimes three, which is ſufficient for the deepeſt ſhade. Care muſt be alſo taken to make the outlines faint and ſmall in ſuch parts as receive the light; but where the ſhades fall, the outline muſt be ſtrong and bold. The learner muſt begin his ſhadings from the top, and proceed downward, and uſe his utmoſt endeavours both by practice and obſervation to learn how to vary the ſhadings properly; for in this conſiſts a great deal of the beauty and elegance of drawing. Another thing to be obſerved is, that as the human ſight is weakened by diſtances, ſo objects muſt ſeem more or leſs confuſed or clear according to the places they hold in the piece: Thoſe that are very diſtant,—weak, faint, and confuſed; thoſe that are near and on the foremoſt ground,—clear, ſtrong, and accurately finiſhed.

### § 7. *Of Drapery.*

In the art of clothing the figures, or caſting the drapery properly and elegantly upon them, many things are to be obſerved. 1. The eye muſt never be in doubt of its object; but the ſhape and proportion of the part or limb, which the drapery is ſuppoſed to cover, muſt appear; at leaſt ſo far as art and probability will permit: and this is ſo material a conſideration, that many artiſts draw firſt the naked figure, and afterwards put the draperies upon it. 2. The drapery muſt not ſit too cloſe to the parts of the body: but let it ſeem to flow round, and as it were to embrace them; yet ſo as that the figure may be eaſy, and have a free motion. 3. The draperies which cover thoſe parts that are expoſed to great light muſt not be ſo deeply ſhaded as to ſeem to pierce them; nor ſhould thoſe members be croſſed by folds that are too ſtrong, leſt by the too great darkneſs of their ſhades the members look as if they were broken. 4. The great folds muſt be drawn firſt, and then ſtroked into leſſer ones: and great care muſt be taken that they do not croſs one another improperly. 5. Folds in general ſhould be large, and as few as poſſible. However, they muſt be greater or leſs according to the quantity and quality of the ſtuffs of which the drapery is ſuppoſed to be made. The quality of the perſons is alſo to be conſidered in the drapery. If they are magiſtrates, their draperies ought to be large and ample; if country clowns or ſlaves, they ought to be coarſe and ſhort; if ladies or nymphs, light and ſoft. 6. Suit the garments to the body, and make them bend with it, according as it ſtands in or out, ſtraight or crooked; or as it bends one way or another; and the cloſer the garment ſits to the body, the narrower and ſmaller muſt be the folds. 7. Folds well imagined give much ſpirit to any kind of action; becauſe their motion implies a motion in the acting member, which ſeems to draw them forcibly, and makes them more or leſs ſtirring as the action is more or leſs violent 8. An artful complication of folds in a circular manner greatly helps the effect of fore-ſhortenings. 9. All folds conſiſt of two ſhades, and no more; which you may turn with the garment at pleaſure, ſhadowing the inner ſide deeper, and the outer more faintly. 10. The ſhades in ſilk and fine linen are very thick and ſmall, requiring little folds and a light ſhadow. 11. Obſerve the motion of the air or wind, in order to draw the looſe apparel all flying one way: and draw that part of the garment that adheres cloſeſt to the body before you draw the looſer part that flies off from it; leſt, by drawing the looſe part of the garment firſt, you ſhould miſtake the poſition of the figure, and place it awry. 12. Rich ornaments, when judiciouſly and ſparingly uſed, may ſometimes contribute to the beauty of draperies. But ſuch ornaments are far below the dignity of angels or heavenly figures; the grandeur of whoſe draperies ought rather to conſiſt in the boldneſs and nobleneſs of the folds, than in the quality of the ſtuff or the glitter of ornaments. 13. Light and flying draperies are proper only to figures in great motion, or in the wind: but when in a calm place, and free from violent action, their draperies ſhould be large and flowing; that, by their contraſt and the fall of the folds, they may appear with grace and dignity. Thus much for drapery; an example or two of which are given in Plate CLXVIII. But ſee farther the articles Crayon and Painting.

### § 8. *On the Paſſions.*

The paſſions, ſays M. Le Brun, are motions of the ſoul, either upon her purſuing what ſhe judges to be for her good, or ſhunning what ſhe thinks hurtful to her;

DRAWING. Plate CLXXI.

A. Bell Prin. Wal. Sculptor fecit.

A. Bell Prin. Wal. Sculptor fecit.

her; and commonly, whatever cauſes emotion of paſſion in the ſoul, creates alſo ſome action in the body. It is therefore neceſſary for a painter to know which are the different actions in the body that expreſs the ſeveral paſſions of the ſoul, and how to delineate them.

M. Le Brun has been extremely happy in expreſſing many of the paſſions, and the learner cannot ſtudy any thing better than the examples which he has left us of them. However, as M. De Piles juſtly obſerves, it is abſurd as well as impoſſible to pretend to give ſuch particular demonſtrations of them as to fix their expreſſion to certain ſtrokes, which the painter ſhould be obliged to make uſe of as eſſential and invariable rules. This, ſays he, would be depriving the art of that excellent variety of expreſſion which has no other principle than diverſity of imagination, the number of which is infinite. The ſame paſſion may be finely expreſſed ſeveral ways, each yielding more or leſs pleaſure in proportion to the painter's underſtanding and the ſpectator's diſcernment.

Though every part of the face contributes towards expreſſing the ſentiments of the heart, yet the eye-brow, according to M. Le Brun, is the principal ſeat of expreſſion, and where the paſſions beſt make themſelves known. It is certain, ſays he, that the pupil of the eye, by its fire and motion, very well ſhows the agitation of the ſoul, but then it does not expreſs the kind or nature of ſuch an agitation; whereas the motion of the eye-brow differs according as the paſſions change their nature. To expreſs a ſimple paſſion, the motion is ſimple; to expreſs a mixed paſſion, the motion is compound: if the paſſion be gentle, the motion is gentle; and if it be violent, the motion is ſo too. We may obſerve farther, ſays he, that there are two kinds of elevation in the eye-brows. One, in which the eye-brows riſe up in the middle: this elevation expreſſes agreeable ſenſations, and it is to be obſerved that then the mouth riſes at the corners: Another, in which the eye-brows riſe up at the ends, and fall in the middle; this motion denotes bodily pain, and then the mouth falls at the corners. In laughter, all the parts agree; for the eye-brows, which fall toward the middle of the forhead, make the noſe, the mouth, and the eyes, follow the ſame motion. In weeping, the motions are compound and contrary; for the eye-brows fall toward the noſe and over the eyes, and the mouth riſes that way. It is to be obſerved alſo, that the mouth is the part of the face which more particularly expreſſes the emotions of the heart: for when the heart complains, the mouth falls at the corners; when it is at eaſe, the corners of the mouth are elevated; and when it has an averſion, the mouth ſhoots forward, and riſes in the middle.

“The head (ſays M. De Piles) contributes more to “ the expreſſion of the paſſions than all the other parts “ of the body put together. Thoſe ſeparately can only “ ſhow ſome few paſſions, but the head expreſſes them “ all. Some, however, are more peculiarly expreſſed “ by it than others: as humility, by hanging it down; “ arrogance, by lifting it up; languiſhment, by inclining “ it on one ſide; and obſtinacy, when with a ſtiff “ and reſolute air it ſtands upright, fixed and ſtiff “ between the two ſhoulders. The head alſo beſt “ ſhows our ſupplications, threats, mildneſs, pride, “ love, hatred, joy, and grief. The whole face, and “ every feature, contributes ſomething: eſpecially the “ eyes; which, as Cicero ſays, are the windows of the “ ſoul. The paſſions they more particularly diſcover “ are, pleaſure, languiſhing, ſcorn, ſeverity, mildneſs, “ admiration, and anger; to which one might add joy “ and grief, if they did not proceed more particularly “ from the eye-brows and mouth; but when thoſe two “ paſſions fall in alſo with the language of the eyes, “ the harmony will be wonderful. But though the “ paſſions of the ſoul are moſt viſible in the lines and “ features of the face, they often require the aſſiſtance “ alſo of the other parts of the body. Without the “ hands, for inſtance, all action is weak and imperfect; “ their motions, which are almoſt infinite, create numberleſs “ expreſſions: it is by them that we *deſire*, *hope*, “ *promiſe*, *call*, *ſend back*; they are the inſtruments of “ *threatening*, *prayer*, *horror*, and *praiſe*; by them we “ *approve*, *condemn*, *refuſe*, *admit*, *fear*, *aſk*; expreſs “ our *joy* and *grief*, our *doubts*, *regrets*, *pain*, and *admiration*. “ In a word, it may be ſaid, as they are “ the language of the dumb, that they contribute “ not a little to ſpeak a language common to all nations, “ which is the language of painting. But to “ ſay how theſe parts muſt be diſpoſed for expreſſing “ the various paſſions, is impoſſible, nor can any exact “ rules be given for it, both becauſe the taſk would “ be infinite, and becauſe every one muſt be guided in “ this by his own genius and the particular turn of his “ own ſtudies.” See the article Passions, and the Plate there referred to.

### § 9. *Of drawing Flowers, Fruits, Birds, Beaſts*, &c.

The learner may proceed now to make ſome attempts at drawing flowers, fruits, birds, beaſts, and the like; not only as it will be a more pleaſing employment, but as it is an eaſier taſk, than the drawing of hands and feet, and other parts of the human body, which require not only more care, but greater exactneſs and nicer judgment. Very few rules or inſtructions are requiſite upon this head; the beſt thing the learner can do is, to furniſh himſelf with good prints or drawings by way of examples, and with great care and exactneſs to copy them. If it is the figure of a beaſt, begin with the forehead, and draw the noſe, the upper and under jaw, and ſtop at the throat. Then go to the top of the head, and form the ears, neck, back, and continue the line till you have given the full ſhape of the buttock. Then form the breaſt, and mark out the legs and feet, and all the ſmaller parts. And, laſt of all, finiſh it with the proper ſhadows. It is not amiſs, by way of ornament, to give a ſmall ſketch of landſkip; and let it be ſuitable and natural to the place or country of the beaſt you draw. Much the ſame may be ſaid with regard to birds. Of theſe, as well as beaſts and other objects, the learner will find many examples among the plates given in this work.

### § 10. *Of drawing Landſcapes, Buildings*, &c.

Of all the parts of drawing, this is the moſt uſeful and neceſſary, as it is what every man may have occaſion for at one time or another. To be able, on the ſpot, to take the ſketch of a fine building, or a beautiful proſpect; of any curious production of art, or uncommon appearance in nature; is not only a very deſirable accompliſhment, but a very agreeable amuſement. Rocks, mountains, fields, woods, rivers, cataracts, cities, towns, caſtles, houſes, fortifications, ruins, or whatſoever elſe may preſent itſelf to view on our journeys or travels in our own or foreign countries, may be thus brought home, and preſerved for our future uſe either in buſineſs or converſation. On this part, therefore, more than ordinary pains ſhould be beſtowed.

All drawing conſiſts in nicely meaſuring the diſtances of each part of the piece by the eye. In order to facilitate this, let the learner imagine in his own mind, that the piece he copies is divided into ſquares. For example: Suppoſe or imagine a perpendicular and a horizontal line croſſing each other in the centre of the picture you are drawing from; then ſuppoſe alſo two ſuch lines croſſing your own copy. Obſerve in the original, what parts of the deſign thoſe lines interſect, and let them fall on the ſame parts of the ſuppoſed lines in the copy: We ſay, the ſuppoſed lines; becauſe though engravers, and others who copy with great exactneſs, divide both the copy and original into many ſquares, as below: yet this is a method not to be recommended, as it will be apt to deceive the learner, who will fancy himſelf a tolerable proficient, till he comes to draw after nature, where theſe helps are not to be had, when he will find himſelf miſerably defective.and utterly at a loſs.

If he is to draw a landſcape from nature, let him take his ſtation on a riſing ground, where he will have a large horizon; and mark his tablet into three diviſions, downwards from the top to the bottom; and divide in his own mind the landſcape he is to take, into three diviſions alſo. Then let him turn his face directly oppoſite to the midſt of the horizon, keeping his body fixed, and draw what is directly before his eyes upon the middle diviſion of the tablet; then turn his head, but not his body, to the left hand, and delineate what he views there, joining it properly to what he had done before; and, laſtly, do the ſame by what is to be ſeen upon his right hand, laying down every thing exactly both with reſpect to diſtance and proportion. One example is given on plate CLXVIII.

The beſt artiſts of late, in drawing their landſcapes, make them ſhoot away one part lower than another. Thoſe who make their landſcapes mount up higher and higher, as if they ſtood at the bottom of a hill to take the proſpect, commit a great error: the beſt way is to get upon a riſing ground, make the neareſt objects in the piece the higheſt, and thoſe that are farther off to ſhoot away lower and lower till they come almoſt level with the line of the horizon, leſſening every thing proportionably to its diſtance, and obſerving alſo to make the objects fainter and leſs diſtinct the farther they are removed from the eye. He muſt make all his lights and ſhades fall one way, and let every thing have its proper motion: as trees ſhaken by the wind, the ſmall boughs bending more, and the large ones leſs: water agitated by the wind, and daſhing againſt ſhips or boats; or falling from a precipice upon rocks and ſtones, and ſpirting up again into the air, and ſprinkling all about: clouds alſo in the air, now gathered with the winds; now violently condenſed into hail, rain, and the like: Always remembering, that whatever motions are cauſed by the wind muſt be made all to move the ſame way, becauſe the wind can blow but one way at once.

Finally, it muſt be obſerved, that in order to attain any conſiderable proficiency in drawing, a knowledge of Perspective is abſolutely neceſſary; ſee that article.

Dray, Drayton.

DRAY, a kind of cart uſed by brewers for carrying barrels of beer or ale; alſo a ſledge drawn without wheels.

Dray, among ſportſmen, denotes ſquirrel neſts built in the tops of trees.

DRAYTON (Michael), an eminent Engliſh poet, born of an ancient family in Warwickſhire in 1563. His propenſity to' poetry was extremely ſtrong, even from his infancy; and we find the moſt of his principal poems publiſhed, and himſelf highly diſtinguiſhed as a poet, by the time he was about 30 years of age.—It appears from his poem of Moſes's Birth and Miracles, that he was a ſpectator at Dover of the famous Spaniſh armada, and it is not improbable that he was engaged in ſome military employent there. It is certain, that not only for his merit as a writer, but his valuable qualities as a man, he was held in high eſtimation, and ſtrongly patronized by ſeveral perſonages of conſequence; particularly by Sir Henry Goodere, Sir Walter Aſton, and the Counteſs of Bedford; to the firſt of whom he owns himſelf indebted for great part of his education, and by the ſecond he was for many years ſupported.

His poems are very numerous; and ſo elegant, that his manner has been copied by many modern writers of eminence ſince. Among theſe the moſt celebrated one is the Poly-Albion, a chorographical deſcription of England, with its commodities, antiquities, and curioſities, in metre of 12 ſyllables; which he dedicated to Prince Henry, by whoſe encouragement it was written: and whatever may be thought of the poetry, his deſcriptions are allowed to be exact. He was ſtyled *poet laureat* in his time: which, as Ben Johnſon was then in that office, is to be underſtood in a looſe ſenſe of approbation as an excellent poet; and was beſtowed on others as well as Drayton, without being confined ſtrictly to the office known by that appellation. He died in 1631; and was buried in Weſtminſter-abbey among the poets, where his buſt is to be ſeen, with an epitaph penned by Ben Johnſon.

Dray
Drea

DREAMS, are all thoſe thoughts which people feel paſſing through their minds, and thoſe imaginary tranſactions in which they often fancy themſelves engaged, when in the ſtate of ſleep.

Scarce any part of nature is leſs open to our obſervation than the human mind in this ſtate. The dreamer

dreamer himſelf cannot well obſerve the manner in which dreams ariſe or diſappear to him. When he awakes, he cannot recollect the circumſtances of his dreams with ſufficient accuracy. Were we to watch over him with the moſt vigilant attention, we could not perceive with certainty what emotions are excited in his mind, or what thoughts paſs through it, during his ſleep. But though we could aſcertain theſe phenomena, many other difficulties would ſtill remain. What parts of a human being are active, what dormant, when he dreams? Why does not he always dream while aſleep? Or why dreams he at all? Do any circumſtances in our conſtitution, ſituation, and peculiar character, determine the nature of our dreams?

We may lay before our readers ſuch facts as have been aſcertained concerning dreaming, and the moſt plauſible conjectures that have been offered to explain thoſe particulars, about which we can only conjecture, or have at leaſt hitherto obtained nothing more certain than conjecture.

1. In dreaming, we are not conſcious of being aſleep. This is well known from a thouſand circumſtances. When awake, we often recollect our dreams; and we remember on ſuch occaſions, that while thoſe dreams were paſſing through our minds, it never occurred to us that we were ſeparated by ſleep from the active world. We are often obſerved to act and talk in dreaming as if we were buſily engaged in the intercourſe of ſocial life.

2. In dreaming, we do not conſider ourſelves as witneſſing or bearing a part in a fictitious ſcene: we ſeem not to be in a ſimilar ſituation with the actors in a dramatic performance, or the ſpectators before whom they exhibit, but engaged in the buſineſs of real life. All the varieties of thought that paſs through our minds when awake may alſo occur in dreams; all the images which imagination preſents in the former ſtate, ſhe is alſo able to call up in the latter; all the ſame emotions may be excited, and we are often actuated by equal violence of paſſion; none of the tranſactions in which we are capable of engaging while awake is impoſſible in dreams: in ſhort, our range of action and obſervation is equally wide in the one ſtate as in the other; and while dreaming, we are not ſenſible of any diſtinction between our dreams and the events and tranſactions in which we are actually concerned in our intercourſe with the world.

3. It is ſaid, that all men are not liable to dream. Dr Beattie, in a very pleaſing eſſay on this ſubject, relates, that he knew a gentleman who never dreamed except when his health was in a diſordered ſtate: and Locke mentions ſomewhere, that a certain perſon of his acquaintance was a ſtranger to dreaming till the 26th year of his age; and then began to dream in conſequence of having a fever. Theſe inſtances, however, are too few, and we have not been able to obtain more; and, beſides, it does not appear that thoſe perſons had always attended, with the care of a philoſopher making an experiment, to the circumſtances of their ſleep. They might dream, but not recollect their dreams on awaking; and they might both dream and recollect their dreams immediately upon awaking, yet afterwards ſuffer the remembrance of them to ſlip out of the memory. We do not advance this therefore as a certain fact concerning dreaming; we are rather inclined to think it a miſtake.

But though it appears to be by no means certain that any of the human race are through the whole of life abſolute ſtrangers to dreaming; yet it is well known that all men are not equally liable to dream. The ſame perſon dreams more or leſs at different times; and as one perſon may be more expoſed than another to thoſe circumſtances which promote this exerciſe of fancy, one perſon may therefore dream more than another. The ſame diverſity will naturally take place in this as in other accidents to which mankind are in general liable.

4. Though in dreams imagination appears to be free from all reſtraint, and indulges in the moſt wanton freaks; yet it is generally agreed, that the imaginary tranſactions of the dreamer bear always ſome relation to his particular character in the world, his habits of action, and the circumſtances of his life. The lover, we are told, dreams of his miſtreſs; the miſer of his money; the philoſopher renews his reſearches in ſleep often with the ſame pain and fatigue as when awake; and even the merchant, at times, returns to balance his books, and compute the profits of an adventure, when ſlumbering on his pillow. And not only do the more general circumſtances of a perſon's life influence his dreams; his paſſions and habits are nearly the ſame when aſleep as when awake. A perſon whoſe habits of life are virtuous, does not in his dreams plunge into a ſeries of crimes; nor are the vicious reformed when they paſs into this imaginary world. The choleric man finds himſelf offended by ſlight provocations as well in his dreams as in his ordinary intercourſe with the world, and a mild temper continues pacific in ſleep.

5. The character of a perſon's dreams is influenced by his circumſtances when awake in a ſtill more unaccountable manner. Certain dreams uſually ariſe in the mind after a perſon has been in certain ſituations. Dr Beattie relates, that he once, after riding 30 miles in a high wind, paſſed a part of the ſucceeding night in dreams beyond deſcription terrible. The ſtate of a perſon's health, and the manner in which the vital functions are carried on, have a conſiderable influence in determining the character of dreams. After too full a meal, or after eating of an unuſual ſort of food, a perſon has always dreams of a certain nature.

6. In dreaming, the mind for the moſt part carries on no intercourſe through the ſenſes with ſurrounding objects. Touch a perſon gently who is aſleep, he feels not the impreſſion. You may awake him by a ſmart blow; but when the ſtroke is not ſufficiently violent to awake him, he remains inſenſible of it. We ſpeak ſoftly beſide a perſon aſleep without fearing that he overhear us. His eye-lids are ſhut; and even though light ſhould fall upon the eye-ball, yet ſtill his powers of viſion are not awakened to active exertion, unleſs the light be ſo ſtrong as to rouſe him from ſleep. He is inſenſible both to ſweet and to diſagreeable ſmells. It is not eaſy to try whether his organs of taſte retain their activity, without awakening him; yet from analogy it may be preſumed that theſe too are inactive. With reſpect to the circumſtances here enumerated,

it is indifferent whether a perſon be dreaming or buried in deep ſleep.

Yet there is one remarkable fact concerning dreaming which may ſeem to contradict what has been here aſſerted. In dreams, we are liable not only to ſpeak aloud in conſequence of the ſuggeſtions of imagination, but even to get up, and walk about and engage in little enterpriſes, without awaking. Now, as we are in this inſtance ſo active, it ſeems that we cannot be then inſenſible of the preſence of ſurrounding objects. The ſleep-walker is really ſenſible in a certain degree of the preſence of the objects around him; but he does not attend to them with all their circumſtances, nor do they excite in him the ſame emotions as if he were awake. He feels no terror on the brink of a precipice; and in conſequence of being free from fear, he is alſo without danger in ſuch a ſituation unleſs ſuddenly awaked. This is one of the moſt inexplicable phenomena of dreaming.

There is alſo another fact not quite conſonant with what has been above advanced. It is ſaid, that in ſleep a perſon will continue to hear the noiſe of a cataract in the neighbourhood, or regular ſtrokes with a hammer, or any ſimilar ſound ſufficiently loud, and continued uninterruptedly from before the time of his falling aſleep. We know not whether he awakes on the ſudden ceſſation of the noiſe. This fact is aſſerted on ſufficient evidence: it is curious. Even when awake. if very deeply intent on any piece of ſtudy, or cloſely occupied in buſineſs, the ſound of a clock ſtriking in the neighbourhood, or the beating of a drum, will eſcape us unnoticed: and it is therefore the more ſurpriſing that we ſhould thus continue ſenſible to ſounds when aſleep.

7. Not only do a perſon's general character, habits of life, and ſtate of health, influence his dreams; but thoſe concerns in which he has been moſt deeply intereſted during the preceding day, and the views which have ariſen moſt frequently to his imagination, very often afford the ſubjects of his dreams. When I look forward with anxious expectation towards any future event, I am likely to dream either of the diſappointment or the gratification of my wiſhes. Have I been engaged through the day, either in buſineſs or amuſements which I have found exceedingly agreeable, or in a way in which I have been extremely unhappy? either my happineſs or my miſery is likely to be renewed in my dreams.

8. Though dreams have been regarded among almoſt all nations through the world, at leaſt in ſome periods of their hiſtory, as prophetic of future events; yet it does not appear that this popular opinion has been eſtabliſhed on good grounds. Chriſtianity, indeed, teaches us to believe, that the Supreme Being may, and actually does, operate on our minds, and influence at times the determinations of our will, without making us ſenſible of the reſtraint to which we are thus ſubjected. And, in the ſame manner, no doubt, the ſuggeſtions which ariſe to us in dreams may be produced. The imaginary tranſactions in which we are then engaged, may be ſuch as are actually to occupy us in life; the ſtrange and ſeemingly incoherent appearances which are then preſented to the mind's eye, may allude to ſome events which are to befall ourſelves or others. It is, therefore, by no means impoſſible, or inconſiſtent with the general analogy of nature, that dreams ſhould have a reſpect to futurity. We have no reaſon to regard the dreams which are related in the Holy Scriptures to have been prophetic of future events, as not inſpired by heaven, or to laugh at the idea of a prophetic dream as abſurd or ridiculous.

Yet it would be too much to allow to dreams all that importance which has been aſcribed to them by the prieſthood among heathen nations, or by the vulgar among ourſelves. We know how eaſily ignorance impoſes on itſelf, and what arts impoſture adopts to impoſe upon others. We cannot trace any certain connection between our dreams and thoſe events to which the ſimplicity of the vulgar pretends that they refer. And we cannot, therefore, if diſpoſed to confine our belief to certain or probable truths, join with the vulgar in believing them really referable to futurity.

9. It appears that the brutes are alſo capable of dreaming. The dog is often obſerved to ſtart ſuddenly up in his ſleep, in a manner which cannot be accounted for any other way than by ſuppoſing that he is rouſed by ſome impulſe received in a dream. The ſame thing is obſervable of others of the inferior animals. That they ſhould dream, is not an idea inconſiſtent with what we know of their economy and manners in general. We may, therefore, conſider it as a pretty certain truth, that many, if not all, of the lower ſpecies are liable to dream as well as human beings.

It appears, then, that in dreaming we are not conſcious of being aſleep: that to a perſon dreaming, his dreams ſeem realities: that though it be uncertain whether mankind are all liable to dreams, yet it is well known that they are not all *equally* liable to dream: that the nature of a perſon's dreams depends in ſome meaſure on his habits of action, and on the circumſtances of his life: that the ſtate of the health too, and the manner in which the vital functions are carried on, have a powerful influence in determining the character of a perſon's dreams: that in ſleep and in dreaming, the ſenſes are either abſolutely inactive, or nearly ſo: that ſuch concerns as we have been very deeply intereſted in during the preceding day, are very likely to return upon our minds in dreams in the hours of reſt: that dreams may be rendered prophetic of future events; and therefore, wherever we have ſuch evidence of their having been prophetic as we would accept on any other occaſion, we cannot reaſonably reject the fact on account of its abſurdity; but that they do not appear to have been actually ſuch, in thoſe inſtances in which the ſuperſtition of nations, ignorant of true religion, has repreſented them as referring to futurity, nor in thoſe inſtances in which they are viewed in the ſame light by the vulgar among ourſelves: and, laſtly, that dreaming is not a phenomenon peculiar to human nature, but common to mankind with the brutes.

We know of no other facts that have been fully aſcertained concerning *dreaming*. But we are by no means ſufficiently acquainted with this important phenomenon in the hiſtory of mind. We cannot tell by what laws of our conſtitution we are thus liable to be ſo frequently engaged in imaginary tranſactions, nor what are the particular means by which the deluſion is accompliſhed. The deluſion is indeed remarkably ſtrong. One will ſometimes have a book preſented to him in a dream, and fancy that he reads, and actually

Dreams.

enter into the nature of the imaginary compoſition before him, and even remember; after he awakes, what he knows, that he only fancied himſelf reading (A). Can this be deluſion? If deluſion, how or for what purpoſes is it produced? The mind, it would appear, does not, in ſleep, become inactive like the body; or at leaſt is not always inactive while we are aſleep. When we do not dream, the mind muſt either be inactive, or the connection between the mind and the body muſt be conſidered as in ſome manner ſuſpended: and when we dream, the mind, though it probably acts in concert with the body, yet does not act in the ſame manner as when we are awake. It ſeems to be clouded or bewildered, in conſequence of being deprived for a time of the ſervice of the ſenſes. Imagination becomes more active and more capricious: and all the other powers, eſpecially judgment and memory, become diſordered and irregular in their operation.

Various theories have been propoſed to explain what appears here moſt inexplicable. The ingenious Mr Baxter, in his Treatiſe on the Immateriality of the Human Soul, endeavours to prove that dreams are produced by the agency of ſome ſpiritual beings, who either amuſe or employ themſelves ſeriouſly in engaging mankind in all thoſe imaginary tranſactions with which they are employed in dreaming. This theory, however, is far from being plauſible. It leads us entirely beyond the limits of our knowledge. It requires us to believe without evidence. It is unſupported by any analogy. It creates difficulties ſtill more inexplicable than thoſe which it has been propoſed to remove. Till it appear that our dreams cannot poſſibly be produced without the interference of other ſpiritual agents, poſſeſſing ſuch influence over our minds as to deceive us with fancied joys, and involve us in imaginary afflictions, we cannot reaſonably refer them to ſuch a cauſe. Beſides, from the facts which have been ſtated as well known concerning dreams, it appears that their nature depends both on the ſtate of the human body and on that of the mind. But were they owing to the agency of other ſpiritual beings, how could they be influenced by the ſtate of the body? Thoſe muſt be a *curious* ſet of ſpiritual beings who depend in ſuch a manner on the ſtate of our corporeal frame. Better not to allow them exiſtence at all, than to place them in ſuch a dependance.

Wolfius, and after him M. Formey, have ſuppoſed, that dreams never ariſe in the mind, except in conſequence of ſome of the organs of ſenſation having been previouſly excited. Either the ear or the eye, or the organs of touching, taſting, or ſmelling, communicate information, ſomehow, in a tacit, ſecret manner; and thus partly rouſe its faculties from the lethargy in which they are buried in ſleep, and engage them in a ſeries of confuſed and imperfect exertions. But what paſſes in dreams is ſo very different from all that we do when awake, that it is impoſſible for the dreamer himſelf to diſtinguiſh, whether his powers of ſenſation *perform* any part on the occaſion. It is not neceſſary that imagination be always excited by ſenſation. Fancy, even when we are awake, often wanders from the preſent ſcene. *Abſence of mind* is incident to the ſtudious: the poet and the mathematician many times forget where they are. We cannot diſcover from any thing that a perſon in dreaming diſplays to the obſervation of others, that his organs of ſenſation take a part in the imaginary tranſactions in which he is employed. In thoſe inſtances, indeed, in which perſons aſleep are ſaid to hear ſounds; the ſounds which they hear are ſaid alſo to influence, in ſome manner, the nature of their dreams. But ſuch inſtances are ſingular. Since then it appears that the perſon who dreams is himſelf incapable of diſtinguiſhing either during his dreams, or by recollection when awake, whether any new impreſſions are communicated to him in that ſtate by his organs of ſenſation; that even by watching over him, and comparing our obſervations of his circumſtances and emotions, in his dreams, with what he recollects of them after awaking, we cannot, except in one or two ſingular inſtances, aſcertain this fact; and that the mind is not incapable of acting while the organs of ſenſation are at reſt, and on many occaſions refuſes to liſten to the information which they convey; we may, without heſitation, conclude, that the theory of Wolfius and Formey has been too haſtily and incautiouſly advanced.

Other phyſiologiſts tell us, that the mind, when we dream, is in a ſtate of *delirium*. Sleep, they ſay, is attended with what is called a *collapſe* of the brain; during which either the whole or a part of the nerves of which it conſiſts, are in a ſtate in which they cannot carry on the uſual intercourſe between the mind and the organs of ſenſation. When the whole of the brain is in this ſtate, we become entirely unconſcious of exiſtence, and the mind ſinks into inactivity: when only a part of the brain is *collapſed*, as they term it, we are then neither aſleep nor awake, but in a ſort of delirium between the two. This theory, like the laſt mentioned, ſuppoſes the mind incapable of acting without the help of ſenſation: it ſuppoſes that we know the nature of a ſtate of which we cannot aſcertain the phenomena; it alſo contradicts a known fact, in repreſenting dreams as confuſed images of things around us, not fanciful combinations of things not exiſting together in nature or in human life. We muſt treat it likewiſe, therefore, as a baſeleſs fabric.

In the laſt edition of this work, a theory ſomewhat different from any of the foregoing was advanced on this ſubject. It was obſerved, that the nervous fluid, which is allowed to be ſecreted from the blood by the brain, appears to be likewiſe abſorbed from the blood by the extremities of the nerves. It was farther advanced, that as this fluid was to be conſidered as the principle of ſenſibility; therefore, in all caſes in which a ſufficient ſupply of it was not abſorbed from the blood by the extremities of the nerves, the parts of the body to which thoſe nerves belonged, muſt be, in ſome degree, deprived of ſenſation. From theſe poſitions it was inferred, that as long as impreſſions of external objects continue to communicate a certain motion from the ſentient extremities of the nerves to the brain,—ſo long we continue awake; and that, when

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(A) The writer of this article has been told by a reſpectable old gentleman of his acquaintance, ſince dead, that he had frequently dreams of this nature. The fact may therefore be conſidered as unqueſtionable.

there is a deficiency of this vital fluid in the extremities of the nerves, or when from any other cauſe it ceaſes to communicate to the brain the peculiar motion alluded to, we muſt naturally fall *aſleep*, and become inſenſible of our exiſtence. It followed of conſequence, that, in ſleep, the nervous fluid between the extreme parts of the nerves and the brain muſt either be at reſt, or be deficient, or be prevented by ſome means from paſſing into the brain: and it was concluded, that whenever irregular motions of this fluid were occaſioned by any internal cauſe, *dreaming* was produced.—In this manner it appeared that we might be deceived with regard to the operation of any of the ſenſes;—ſo as to fancy that we ſaw objects not actually before us,—to hear imaginary ſounds,—to taſte,—to feel, and to ſmell in imagination. The inſtances of viſions which will ſometimes ariſe, and as it were ſwim before us when awake, though our eyes be ſhut, *tinnitus aurium*, which is often a ſymptom in nervous diſeaſes, and the ſtrange feelings in the caſe of the amputated limb, were produced in proof of this theory, and applied ſo as to confirm it.

We are ſtill of opinion, that this theory is more plauſible, and goes farther towards explaining the nature of *dreaming*, and the manner in which *dreams* are produced, than any other with which we are acquainted. But it muſt be confeſſed, upon a review, that even in it there is too much ſuppoſition. The nature of the nervous fluid is but imperfectly known, and even its exiſtence not very fully aſcertained. The nature of the connection by which the ſoul and body are united, ſeems to be almoſt beyond our comprehenſion. And till we can apply experiment and obſervation in a better manner to this branch of phyſiology, it muſt undoubtedly remain unknown. To ſomething myſterious in the nature of that connection, the deluſion produced in dreams is in all probability owing.

Amid this uncertainty with reſpect to the manner in which our powers of mind and body perform their functions in dreaming; it is pleaſing to find that we can, however, apply to uſeful purpoſes the imperfect knowledge which we have been able to acquire concerning this ſeries of phenomena. Our dreams are affected by the ſtate of our health, by the manner in which we have paſſed the preceding day, by our general habits of life, by the hopes which we moſt fondly indulge, and the fears which prevail moſt over our fortitude when we are awake. From recollecting our dreams, therefore, we may learn to correct many improprieties in our conduct; to refrain from bodily exerciſes, or from meats and drinks that have unfavourable effects on our conſtitution; to reſiſt, in due time, evil habits that are ſtealing upon us; and to guard againſt hopes and fears which detach us from our proper concerns, and unfit us for the duties of life. Inſtead of thinking what our dreams may forebode, we may with much better reaſon reflect by what they have been occaſioned, and look back to thoſe circumſtances in our paſt life to which they are owing. The ſleep of innocence and health is ſound and refreſhing; their dreams delightful and pleaſing. A diſtempered body, and a polluted or perturbed mind, are haunted in ſleep with frightful, impure, and unpleaſing dreams.

Some very beautiful fables have been written both by ancients and moderns in the form of dreams. The *Somnium Scipionis* is one of the fineſt of Cicero's compoſitions. He who ſhall carefully peruſe this piece with Macrobius's commentary upon it, will acquire from them conſiderable knowledge of ancient philoſophy. In the periodical publications, which have diffuſed ſo much elegant and uſeful knowledge through Britain, the Tatlers, Spectators, Guardians, &c. we find a number of excellent dreams. Addiſon excelled in this way of writing. The public are now leſs partial to this ſpecies of compoſition than they formerly were.

Dr Beattie, in his valuable eſſay on the ſubject of dreaming, quotes a very fine one from the Tatler, and gives it due praiſe.

The reader who is diſpoſed to ſpeculate farther on this ſubject, may conſult Beattie's Eſſays, Hartley on Man, and the principal writers on phyſiology.

**DRELINCOURT** (Charles), miniſter of the reformed church at Paris, was born at Sedan in 1595, where his father enjoyed a conſiderable poſt. He had all the qualifications that compoſe a reſpectable clergyman; and though he defended the Proteſtant cauſe againſt the Romiſh religion, was much eſteemed even among the Catholics. He is beſt known in England by his Conſolations againſt the Fears of Death, which work was tranſlated, and is often printed. He married the daughter of a rich merchant at Paris, by whom he had 16 children. His third ſon, profeſſor of phyſic at Leyden, was phyſician to the Prince and Princeſs of Orange before their acceſſion to the crown of England. Bayle has given him a high character. Mr Drelincourt died in 1660.

**DRENCH**, among farriers, a phyſical potion for horſes. The ingredients for this purpoſe are to be beat coarſely, and either mingled with a decoction or with wine. Then let all infuſe about a quarter of an hour, and give it to the horſe with a horn after he has been tied up two hours to the rack.

**DREPANE**, the ancient name of Corcyra, from the curvity of its figure, reſembling a ſickle.

**Drepane**, *Drepanum*, (anc. geog.), a town of Bithynia, ſituated between the Sinus Aſtacenus and the Boſphorus Thracius; called *Helenopolis* by Conſtantine, in honour of his mother Nicephorus Calliſtus.

**DREPANUM** (anc. geog.), the promontory Rhium in Achaia; ſo called becauſe bent in the manner of a ſickle.—Another *Drepanum* on the Arabic Gulf, on the ſide of Egypt. A third on the north ſide of Crete, ſituated between Cydonia and the Sinus Amphimallus. A fourth on the weſt ſide of Cyprus. A fifth, a promontory of Cyrenaica, on the Mediterranean.

**Drepanum**, *-i*, or *Drepana*, *-orum*, a town and port on the weſt ſide of Sicily, and to the weſt of mount Eryx: *Drepanitani* the people. Now *Trepano*, a city and port-town on the weſtmoſt point of Sicily. E. Long. 12. 8. Lat. 38. 0.

**DRESDEN**, the capital city of the electorate of Saxony in Germany. It is ſeated on the river Elbe, which divides it into two parts. One part is called *Old Dreſden*, and the other the *New Town*, in the German language *New Stadt*. They are joined together by a ſtone bridge, ſupported by 19 piers, and 630 paces in length.

length. As this bridge was too narrow for the crowds of people that were continually paſſing and repaſſing, King Auguſtus, in 1730, cauſed two walks for foot-paſſengers to be built, one on each ſide, in a very wonderful manner; the one for thoſe that go into the city, and the other for thoſe that return back. Theſe are bordered with iron palliſadoes of curious workmanſhip. Dreſden is ſurrounded by ſtrong and handſome fortifications; and contains, according to the lateſt accounts, 110,000 inhabitants.

All the buildings of this city are conſtructed with ſquare free ſtone, and are almoſt all of the ſame height. They have ſtone from the neighbourhood of Pirna, about ten miles from this city, which is readily brought down the Elbe. In general the houſes are high and ſtrong; the ſtreets wide, ſtraight, well paved, clean, and well illuminated in the night; and there are large ſquares, diſpoſed in ſuch a manner, that Dreſden may paſs for one of the handſomeſt cities in the world. The elector's palace is a magnificent ſtructure, and abounds in many valuable curioſities both of nature and art. The collection of pictures is reckoned one of the fineſt that exiſts, and is valued at 500,000 l.

Above 700 men are here conſtantly employed in the porcelain manufacture, the annual expence of which is eſtimated at no more than 80,000 crowns; and the manufacture yields to the king 200,000 crowns yearly, beſides the magnificent preſents which he occaſionally makes, and the large quantity reſerved for the uſe of his houſehold.

The other moſt conſiderable article of trade is ſilver, of which the mines near Fridburg produce every 15 days near the value of 20,000 dollars. The metal is brought into the city in ingots, where it is immediately coined and delivered to the proprietors.

The court of Dreſden is one of the moſt remarkable in Europe for ſplendor and profuſion. Six thouſand five hundred ducats are yearly allowed for comfits and ſimilar articles, which is near twice as much as the king of Pruſſia allows for the whole expence of his table. The revenues of the elector are eſtimated at about 1,576,000 l.; which ariſe from the taxes on lands, and a capitation of ſix dollars on all males as ſoon as they commence an apprenticeſhip or begin to work. People of a higher rank are taxed according to their claſs, and are liable to be called to account if they aſſume not an exterior appearance correſpondent to the extent of their fortune. Every foreigner pays capitation after reſiding ſix months in the country. The Jews are taxed at 50, their wives at 30, and their children at 20 dollars. There is alſo an exciſe on all eatables and liquors; and 10 *per cent.* is levied out of the incomes of the people.

Though this city lies in a low ſituation, yet it hath agreeable proſpects. It is ſupplied with a prodigious quantity of proviſions, not only out of the neighbourhood, but from Bohemia, which are brought every market-day, which is once a-week. E. Long. 13. 34. N. Lat. 51. 12.

DRESSING of HEMP and FLAX. See *FLAX-Dreſſing*.

*DRESSING of Meats*, the preparing them for food by means of culinary fire.

The deſign of dreſſing is to looſen the compages or texture of the fleſh, and diſpoſe it for diſſolution and digeſtion in the ſtomach. Fleſh not being a proper food without dreſſing, is alleged as an argument that man was not intended by nature for a carnivorous animal.

The uſual operations are roaſting, boiling, and ſtewing.—In roaſting, it is obſerved, meat will bear a much greater and longer heat than either in boiling or ſtewing; and in boiling, greater and longer than in ſtewing. The reaſon is, that roaſting being performed in the open air, as the parts begin externally to warm, they extend and dilate, and ſo gradually let out part of the rarefied included air, by which means the internal ſuccuſſions, on which the diſſolution depends, are much weakened and abated. Boiling being performed in water, the preſſure is greater, and conſequently the ſuccuſſions to lift up the weight are proportionably ſtrong; by which means the coction is haſtened: and even in this way there are great differences; for the greater the weight of water, the ſooner is the buſineſs done.

In ſtewing, though the heat be infinitely ſhort of what is employed in the other ways, the operation is much more quick, becauſe performed in a cloſe veſſel, and full; by which means the ſuccuſſions are oftener repeated, and more ſtrongly reverberated. Hence the force of Papin's digeſtor; and hence an illuſtration of the operation of digeſtion.

Boiling, Dr Cheyne obſerves, draws more of the rank ſtrong juices from meat, and leaves it leſs nutritive, more diluted, lighter, and eaſier of digeſtion: roaſting, on the other hand, leaves it fuller of the ſtrong nutritive juices, harder to digeſt, and needing more dilution. Strong, grown, and adult animal food, therefore, ſhould be boiled; and the younger and tenderer roaſted.

DRESSING, in ſurgery, the treatment of a wound or any diſordered part. The apparatus of dreſſing conſiſts of doſſils, tents, plaſters, compreſſes, bandages, bands, ligatures, and ſtrings. See SURGERY.

DREXELIUS (Jeremiah), a Jeſuit celebrated for his piety and writings, was born at Auſburg, and became preacher in ordinary to the elector of Bavaria. He wrote ſeveral pious and practical pieces, which have been printed together in two volumes folio; and died in 1638.

DREVET (Peter) the Younger, an eminent French engraver, was a member of the royal academy of painting and ſculpture; and died at Paris in 1739, at 42 years of age. His portraits are neat and elegant; but laboured to the laſt degree. He particularly excels in repreſenting lace, ſilk, fur, velvet, and other ornamental parts of dreſs.—His father was excellent in the ſame art; and had inſtructed, but was ſurpaſſed by the ſon. The younger Drevet did not confine himſelf to portraits. We have ſeveral hiſtorical prints by him, which in point of neatneſs and exquiſite workmanſhip are ſcarcely to be equalled. His moſt eſteemed and beſt hiſtorical print is very valuable; but the firſt impreſſions of it are rarely to be met with: it is, The Preſentation of Chriſt in the Temple; a very large plate, lengthwiſe, from Louis de Bologna. The following deſerve alſo to be particularized. The Meeting of Abraham's Servant with Rebecca at the

Well; a large upright plate, from An. Coypel: and Abraham, with his Son Iſaac on the Altar, the ſame, from the ſame, dated 1707; the firſt impreſſions of which are before the work upon the right thigh of Iſaac was altered, the curved lines from the button almoſt down to the knee being in thoſe impreſſions arched downwards, but in poſterior ones arched upwards. Among his portraits, the two following are juſtly held in the higheſt eſtimation: M. Boſſuet Biſhop of Meaux; a whole-length figure ſtanding, a middling ſized upright plate, from Rigaud: and Samuel Bernard; a whole-length figure ſitting in a chair, a large upright plate. The firſt impreſſions of the laſt are, before the words *Conſeiller d'Etat* were inſerted upon the plate.

DREUX, a town in the Iſle of France, remarkable for its antiquities; and for the battle which was fought in December 1562 between the Papiſts and the Proteſtants, wherein the former gained the victory. Some think it took its name from the prieſts of Gaul, called the *Druids*, in the times of Paganiſm. It conſiſts of two pariſhes, St Stephen's and Notre Dame, called the *great church*, which is pretty well built. It is ſeated on the river Blaiſe, at the foot of a mountain, on which is a ruined caſtle. E. Long. 1. 27. N. Lat. 48. 44.

DRIEPER, or DNIEPER, a river of Ruſſia, which riſes in the foreſt of Volkonſki, near the ſource of the Volga, about 100 miles from Smolenſko. It paſſes by Smolenſko and Mohilef, ſeparates the Ukraine from Poland, flows by Kiof, and falls into the Black Sea between Otzakof and Kinburn. By the acquiſition of the province of Mohilef, its whole courſe is now included within the Ruſſian territories. It begins to be navigable at a little diſtance above Smolenſko, though in ſome ſeaſons of the year it is ſo ſhallow near the town, that the goods muſt be tranſported upon rafts and ſmall flat-bottomed boats.

DRIFT, in navigation, the angle which the line of a ſhip's motion makes with the neareſt meridian, when ſhe drives with her ſide to the wind and waves, and is not governed by the power of the helm: it alſo implies the diſtance which the ſhip drives on that line.

A ſhip's way is only called *drift* in a ſtorm; and then when it blows ſo vehemently as to prevent her from carrying any ſail, or at leaſt reſtrains her to ſuch a portion of ſail as may be neceſſary to keep her ſufficiently inclined to one ſide, that ſhe may not be diſmaſted by her violent labouring produced by the turbulence of the ſea.

DRIFT, in mining, a paſſage cut out under the earth betwixt ſhaft and ſhaft, or turn and turn; or a paſſage or way wrought under the earth to the end of a meer of ground, or part of a meer.

*Drift-Sail*, a ſail uſed under water, veered out right a-head by ſheets, as other ſails are. It ſerves to keep the ſhip's head right upon the ſea in a ſtorm, and to hinder her driving too faſt in a current.

DRILL, in mechanics, a ſmall inſtrument for making ſuch holes as punches will not conveniently ſerve for. Drills are of various ſizes, and are chiefly uſed by ſmiths and turners.

DRILL, or *Drill-Box*, a name given to an inſtrument for ſowing land in the new method of horſe-hoeing huſbandry. See AGRICULTURE.

*Drill-Sowing*, a method of ſowing grain or ſeed of any kind, ſo that it may all be at a proper depth in the earth, which is neceſſary to its producing healthful and vigorous plants. For this purpoſe a variety of drill-ploughs have been invented and recommended; but from the expence attending the purchaſe, and the extreme complication of their ſtructure, there is not an inſtrument of that kind, as yet diſcovered, that is likely to be brought into general uſe. This method, however, is greatly recommended in the Georgical Eſſays, where we have the following obſervations and experiments.—“ Grain ſown by the hand, and covered by the harrows, is placed at unequal depths; the ſeeds conſequently ſprout at different times, and produce an unequal crop. When barley is ſown late, and a drought ſucceeds, the grain that was buried in the moiſture of the earth ſoon appears, while ſuch as was left near the ſurface lies baking in the heat of the ſun, and does not vegetate till plentiful rains have moiſtened the ſoil. Hence an inequality of the crop, an accident to which barley is particularly liable. The ſame obſervation, but in a more ſtriking manner, may be made upon the ſowing of turnips. It frequently happens that the huſbandman is obliged to ſow his ſeed in very dry weather, in hopes that rain will ſoon follow; and either rolls or covers it with a buſh-harrow. We will ſuppoſe, that, contrary to his expectations, the dry weather continues. The ſeed, being near the ſurface, cannot ſprout without rain. The huſbandman is mortified at his diſappointment, but is ſoon ſatisfied and made eaſy by a perfect acquieſcence in what he thinks is the will of Providence. The ſcourge that he feels muſt not be placed to the diſpenſation of Providence, but has its ſource in the ignorance of the man himſelf. Had he judiciouſly buried the ſeed in the moiſt part of the ſoil with the drill plough, or harrowed it well with the common harrow, his ſeed would have vegetated in due ſeaſon, and bountifully repaid him for his toil.

“ In the year 1769, a 15 acre cloſe was prepared fur turnips. The land was in fine condition as to lightneſs, and had been well manured. On the 24th of June, 14 acres were ſown with turnip-ſeed broad-caſt, and harrowed in with a buſh-harrow. The remaining acre was ſowed the ſame day with the drill-plough, allowing 14 inches between the rows, and the ſhares being ſet near two inches deep. At the time of ſowing, the land was extremely dry, and the drought continued from the time of ſowing to the 5th of July: ſo that the broad caſt did not make its appearance till about the 8th of that month, at which time the drill turnips were in rough leaf, having appeared upon the ſurface the ſixth day after ſowing.

“ In the drieſt ſeaſons, at the depth of two inches or leſs, we are ſure of finding a ſufficiency of moiſture to make the ſeed germinate. When that is once accompliſhed, a ſmall degree of moiſture will carry on the work of vegetation, and bring the tender plants forward to the ſurface. When extreme dry weather obliges the broad-caſt farmer to ſow late, he has no opportunity of ſowing a ſecond time if the fly ſhould get into the field. The drill ſecures him in ſome degree againſt that misfortune, by giving him a full command over the ſeaſons.

“ The excellence of the drill-plough is not confined to turnip-ſeed; it is an uſeful inſtrument for ſowing all kinds

kinds of grain. By burying the ſeeds at an equal depth, it ſecures an equal crop in all circumſtances of the weather. But this is not the only conſideration to the cultivator. It ſaves near one half of his ſeed, which is an object of importance to the tillage farmer.

“In the ſpring of the year 1769, an acre of barley was ſowed in equidiſtant rows with the drill-plough, in a field which was ſown with the ſame grain and upon the ſame day broad-caſt.—The broad-caſt took three buſhels per acre; the drill required only ſix pecks. The drills were eight inches aſunder, and the ſeed was lodged about two inches within the ſoil. The drill acre was finiſhed within the hour, and the moſt diſtinguiſhing eye could not diſcover a ſingle grain upon the ſurface.

“In the courſe of growing, the drill barley ſeemed greener and bore a broader leaf than the broad-caſt. When the ears were formed throughout the field, the ear of the drill barley was plainly diſtinguiſhed to be near half an inch longer than the broad-caſt, and the grains ſeemed fuller and better fed.

“Drill-ſowing, however, though it may be recommended as a moſt rational and judicious practice, has many difficulties to overcome, and perhaps will never be brought into general uſe. A proper inſtrument is wanting that would come cheap to the farmer, and have the requiſites of ſtrength and ſimplicity to recommend it. The preſent inſtruments cannot by any means be put into the hands of common ſervants. Should we ever be ſo happy as to ſee this objection removed, it is probable that all kinds of grain will be cultivated in drills. Corn growing in that manner has a freer enjoyment of air, and the farmer has an opportunity of hand-hoeing and weeding without injury to the growing crop. This is an object of the utmoſt conſequence in the cultivation of beans and winter corn.

“The beſt inſtrument for drilling of grain is the invention of the ingenious Mr Craick, and made by Mr Crichton coach-maker in Edinburgh. It works with four coulters, and the price is 12l. With it, one man, a horſe, and a boy, can eaſily ſow four acres a-day.”

DRILLING is popularly uſed for exerciſing ſoldiers. The word is derived from the French *drille*, which ſignifies a *raw ſoldier*.

DRIMYS, in botany: A genus changed by Murray, in the 14th edit. of *Syſt. Veget.* to WINTERA; which ſee.

DRINK, a part of our ordinary food in a liquid form. See FOOD.

The general uſe of drink is, to ſupply fluid; facilitate ſolution; in conſequence of that, to expede the evacuation of the ſtomach, and promote the progreſs of the aliment through the inteſtines: for, by the contraction of the longitudinal fibres of the ſtomach, the pylorus is drawn up, and nothing but fluid can paſs; which, by its bulk, makes a hurried progreſs through the inteſtines, and ſo determines a greater excretion by ſtool, as leſs then can be abſorbed by the lacteals. Hence a large quantity of common water has been found purgative; and, *cæteris paribus*, that aliment which is accompanied with the largeſt proportion of drink, makes the largeſt evacuation by ſtool. Here a queſtion has ariſen, about where the feculent part of the aliment is firſt remarkably collected. It is commonly thought to be in the great guts: but undoubtedly it often begins in the lower part of the ileum, eſpecially when the drink is in ſmall proportion, and when the progreſs of the aliment is ſlow; for when the contents of the guts are very fluid, they are quickly puſhed on, and reach the great guts before they depoſit any feculency. Another effect of drink is, to facilitate the mixture of the lymph, refluent from every part of the ſyſtem, with the chyle. In the blood-veſſels, where all muſt be kept fluid in order to proper mixture, drink increaſes the fluidity, and gives tenſion, by its bulk, without concomitant acrimony or too much elaſticity, and ſo ſtrength and oſcillatory motion: hence drink contributes to ſanguification, as ſometimes food gives too denſe a nutriment to be acted upon by the ſolids; and hence alſo we can ſee how drink promotes the ſecretions. Theſe are the effects of drink in general; but what has been ſaid muſt be taken with ſome limitations; for the more liquid the food, it is ſooner evacuated, and leſs nouriſhment is extracted. Hence drink is, in ſome degree, oppoſed to nouriſhment; and ſo, *cæteris paribus*, thoſe who uſe leaſt drink are moſt nouriſhed.

All the effects of drink above mentioned are produced by ſimple water; and it may be ſaid, that other liquors are fit for drink in proportion to the water they contain. Water, when uſed as drink, is often impregnated with vegetable and farinaceous ſubſtances; but, as drinks, theſe impregnations are of little conſequence: they add, indeed, a little nouriſhment; but this is not to be regarded in a healthy ſtate. Sometimes we impregnate water with the *fructus acido-dulces*; and then, indeed, it acquires other qualities, of conſiderable uſe in the animal economy. All drinks, however, may be reduced to two heads: firſt, pure water, or where the additional ſubſtance gives no additional virtue; ſecondly, the *fermentatæ*. Of the firſt we have already ſpoken; and the latter have not only the qualities of the firſt, but alſo qualities peculiar to themſelves.

Fermented liquors are more or leſs poignant to the taſte, and better calculated to quench thirſt. Thirſt may be owing to various cauſes: firſt, to defect of fluid in the ſyſtem, which occaſions a ſcanty ſecretion in the mouth, fauces, and ſtomach; the dryneſs of the mouth and fauces will alſo in this caſe be increaſed, by their continual expoſure to the perpetual flux and reflux of the evaporating air. Secondly, thirſt depends on a large proportion of ſolid viſcid food: thirdly, on an alkaleſcent aliment, eſpecially if it has attained any thing of the putrefactive taint: fourthly, on the heat of the ſyſtem; but this ſeems to operate in the ſame manner as the firſt cauſe, giving a ſenſe of dryneſs from its diſſipation of the fluids. The fermented liquors are peculiarly adapted for obviating all theſe cauſes; ſtimulating the mouth, fauces, and ſtomach, to throw out the ſaliva and gaſtric liquor by their poignancy: by their aceſcency they are fitted to deſtroy alkaleſcent acrimony, to quench thirſt from that cauſe: by their fluidity they dilute viſcid food; though here, indeed, they anſwer no better than common water. In two ways they promote the evacuation by ſtool, and progreſs through the inteſtines: firſt, by their fluidity and bulk; ſecondly, by their aceſcency, which, uniting with the bile, forms the peculiar ſtimulus formerly mentioned. Carried into the blood-veſſels, in ſo far as they retain any of the ſaline nature, they ſtimulate the excretories, and promote urine and ſweet; correcting thus alkaleſcency, not only by mixture, but diſſipation of the degenerated fluids.

Many phyſicians, in treating of fermented liquors, have only mentioned theſe qualities, rejecting their nutritious virtue, which certainly ought to be taken in; though by expediting the evacuation by ſtool they make leſs of the nutritious parts of the aliment to be taken up, and by ſtimulating the excretories make theſe nutritious parts to be for a ſhorter time in the ſyſtem. All theſe and many more effects ariſe from fermented liquors. Their aceſcency ſometimes promotes the diſeaſe of aceſcency, by increaſing that of vegetables, acting as a ferment, and ſo producing flatulency, purging, cholera, &c.: ſo that, with vegetable aliment, as little drink is neceſſary, the moſt innocent is pure water; and it is only with animal food that fermented liquors are neceſſary. In warmer climates, *fermentata* would ſeem neceſſary to obviate alkaleſcency and heat. But it ſhould be conſidered, that though fermented liquors contain an acid, yet they alſo contain alcohol; which, though it adds ſtimulus to the ſtomach, yet is extremely hurtful in the warmer climates, and wherever alkaleſcency prevails in the ſyſtem. Nature, in theſe climates, has given men an appetite for water impregnated with acid fruits, *e. g.* ſherbet; but the uſe of this needs caution, as in theſe countries they are apt to ſhun animal food, uſing too much of the vegetable, and often thus cauſing dangerous refrigerations, choleras, diarrhœas, &c.

Of varieties of fermented liquors. We ſhall only mention here the chief heads on which theſe varieties depend. Firſt, they are owing to the quality of the ſubject, as more or leſs viſcid; and to its capacity alſo of undergoing an active fermentation, although perhaps the more viſcid be more nutritious. Hence the difference between ales and wines; by the firſt meaning fermented liquors from *farinacea*, by the ſecond from the fruits of plants. It depends, ſecondly, on the acerbity, acidity, nature, and maturation, of the fruit. Thirdly, the variety depends on the conduct of the fermentation. In general, fermentation is progreſſive, being at firſt active and rapid, detaching the fixed air or *gas ſylveſtre*, at the ſame time acquiring more acid than before. Theſe qualities of flatulency and acidity remain for ſome time; but as the fermentation goes on, the liquor becomes more perfect, no air is detached, and alcohol is produced; ſo that fermented liquors differ according to the progreſs of the fermentation, and have different effects on the ſyſtem. When fermentation is ſtopped before it comes to maturity, though naturally it proceeds in this way, yet by addition of new ferment it may again be renewed with a turbid inteſtine motion.

DRIVERS, among ſportſmen, a machine for driving pheaſant-powts, conſiſting of good ſtrong ozier wands, ſuch as the baſket-makers uſe; theſe are to be ſet in a handle, and twiſted or bound with ſmall oziers in two or three places. With this inſtrument the ſportſman drives whole eyes of young powts into his nets. See the next article.

DRIVING, among ſportſmen, a method of taking pheaſant-powts. It is thus: The ſportſman finds out the haunts of theſe birds; and having fixed his nets there, he calls upon them together by a pheaſant-call, imitating the voice of the dam; after this he makes a noiſe with his driver, which will make them run a little way forward in a cluſter; and this he is to repeat till he has made ſure of them, which an expert ſportſman never fails to do, by driving them into his nets.

DRIVING, in metallurgy, is ſaid of ſilver, when, in the operation of refining, the lead being burnt away, the remaining copper riſes upon its ſurface in red fiery bubbles.

DRIVING, in the ſea-language, is ſaid of a ſhip, when an anchor being let fall will not hold her faſt, nor prevent her ſailing away with the wind or tide. The beſt help in this caſe is to let fall more anchors, or to veer out more cable; for the more cable ſhe has out, the ſafer ſhe rides. When a ſhip is a-hull or a-try, they ſay ſhe drives to leeward.

DROGHEDA, by the Engliſh called *Tredah*, a town of Ireland, in the province of Leinſter and county of Lowth, and ſituated on a bay of the ſame name, in W. Long. 6. 17. N. Lat. 53. 45. It was formerly very remarkable for its ſituation and ſtrength. In conſequence of this it was much diſtinguiſhed by the old Engliſh monarchs. Edward II. granted it a market and fair; and to theſe were added other great privileges in ſucceeding ages, particularly the right of coinage. It was bravely defended againſt the rebels in 1641. After the ceſſation of arms it was taken by the duke of Ormond and the earl of Inchiquin; but was retaken by Cromwell in 1649. At this time it ſuffered ſo much, that for a long time after it remained almoſt in ruins. The buildings were exceedingly ſhattered; and the town being taken by ſtorm, not only the garriſon, but the inhabitants, men, women, and children, were moſtly put to the ſword. By degrees, however, it recovered, and is at preſent a large and populous place. It is a town and county; and as ſuch ſends two repreſentatives to parliament. It has a great ſhare of inland trade, and an advantageous commerce with England: and though the port is but indifferent, and narrow at its entrance, with a bar over which ſhips of burden cannot paſs but at high water, yet a great deal of buſineſs is done; ſo that, from a low and declining port, it is now become rich and thriving.

Drogheda is perhaps one of the ſtrongeſt inſtances that can be mentioned of the ineſtimable benefit of a river in any degree navigable: for though the Boyne is not capable of carrying veſſels bigger than barges, or pretty large boats, yet the conveniency that this affords of conveying coals by water-carriage through a great extent of country, introduced a correſpondence between this place and Whitehaven in Cumberland, to which the revival of its commerce has been in a great meaſure owing.

DROITWICH, a town of Worceſterſhire in England, noted for excellent white ſalt made from the ſalt ſprings in its neighbourhood. It ſends two members to parliament. W. Long. 2. 16. N. Lat. 52. 20.

DROMEDARY. See CAMELUS.

DROMORE, a town of Ireland, in the county of Down. It is a very ancient town, and the ſeat of a biſhopric. The ſee was founded by St Colman in the 6th century. It was refounded by King James I. who, by his charters (now preſerved in the Rolls-office), granted it very great and uncommon privileges. Among other marks of royal favour, he diſtinguiſhes the biſhops of this ſee by the ſtyle of "A. B. by Divine Providence biſhop of Dromore:" whereas all other biſhops in Ireland, except thoſe of Meath and Kildare, are ſtyled, "by Divine Permiſſion." This ſee, although the leaſt in its extent, is ſo complete and perfect in its endowment and juriſdiction, that it need not envy the greateſt and moſt opulent.

DRONE, a kind of large bees which make their appearance in hives about the month of May, but never work nor prepare any honey; and are at laſt all killed by the reſt. Under the article Bee, n° 20 *et ſeq.* we have given an account of the experiments of Meſſrs Debraw and Schirach concerning theſe animals: but ſince that article was printed, a Treatiſe upon Bees and their Management has appeared by Mr Bonner near Berwick on Tweed, who has made the management of bees his ſtudy for a great number of years, and who diſſents from the opinions of the above mentioned gentlemen for the following reaſons, which we ſhall give in his own words. Having mentioned the opinions of Mr Debraw concerning the little drones mentioned in the article above mentioned, he proceeds thus:

"1. Can it be thought that the prying eyes of multitudes in many generations ſhould have eſcaped ſeeing thoſe little drones (they being, according to his account, vaſtly numerous) thruſt their poſterior parts into the cells? Yet none ever ſaw them do it except himſelf; while many have ſeen the queen do it, though but a ſingle bee.

"2. It is well known the queen is very long behind the wings, wiſe nature having made her ſo, in order that ſhe might thruſt her poſterior part into the cells, and yet her wings ſcarcely touch them, nor receive the leaſt injury. If theſe imaginary little drones had to thruſt their poſterior parts into the cells in the ſame manner as the queen, certainly their wings would have been made in the ſame manner ſhort, and their poſterior parts long and taper, which is not the caſe. Whereas were a bee of any kind (the queen excepted) to thruſt its hinder part into a common cell, its wings or coats would come over its head, and be antic like, and injure both them and its body. Beſides, I ſcarcely think they could get into the common cells that way at any rate for want of room.

"3. Mr Debraw grants, that without a queen or eggs bees will not begin to work, as well knowing they cannot propagate their ſpecies without her; and yet he ſays, thoſe bees which wanted little drones began to work, and the queen laid eggs, and all went forward, till they were not impregnated, and then they gave over work, and deſerted the hive. Certainly thoſe ſagacious creatures would have been as ſenſible that they wanted drones at the very firſt, when they were put into the hive, and that they could not do without them, as they are ſenſible when they want a queen, and that it is needleſs to begin work without her; and it might be added, that two different kinds of drones in one hive does not appear to be probable, or ſerve any end.

"But I ſhall narrate ſome of my own experiments on that head, which will put it, I hope, beyond diſpute: On September 1ſt, I had a hive breeding faſt; I took out all her bees (among which were only four large drones, which I killed), and I put them in a hive that had nothing in her but empty combs: I waited ten days, when, by looking between the combs, I ſaw her have new-ſealed up maggots in her cells. I then took all her bees out, and ſhook them into a tub full of water, and recovered them gradually; and when recovering, I preſſed every one of them, in order to ſee if I could find any of thoſe little drones, but could not find one; but all and every one of them had ſtings: they were in number 3000. After which I ſearched the hive I took them out of, and cut out all her combs that had eggs in them, and found they had new laid eggs, four days old eggs, and maggots in them. I then recovered the queen and all the bees, and put in the ſame hive again, which had not an egg in her now, and waited other twenty days, and ſaw her in fine days working very well; a ſure indication ſhe was breeding again. I then turned her up, and cut out one of her brood-combs, and ſaw in it new laid eggs, four days old eggs, and maggots, and ſome young almoſt fit for emerging out of their cells.

"The very ſame day I made a further experiment: I had a hive which I ſaw had ſome brood-combs in her, but ſhe had not had a large drone for four weeks before in her: ſhe had not above 500 bees in her, which favoured me, becauſe few in number. I took the hive into a cloſe place in my houſe, in order that not a ſingle bee ſhould eſcape me: I then took all her bees out of her, and immerſed them in water; and when recovering, I preſſed every one of them, and each bee had a ſting, as in the former experiment.

"I think the above experiments may ſatisfy any judicious perſon, that there is no ſuch thing in being as little drones, unleſs in Mr Debraw's brain. And if Mr Debraw, who can find 57 in a ſmall ſwarm of bees, will ſend me the odd ſeven, I will ſend him one of my beſt hives for them, and he will ſcarcely think he is ill paid. I add, I never ſaw a hive in ſpring, however few bees in her, but ſhe bred ſome if ſhe had a queen, though to be ſure few in proportion to her bees.

"By this time the reader will be very ready, no doubt, to aſk me the uſe of the drones. I beg to be excuſed on that head, as I have not the leaſt idea of their uſe in a hive; they do not fecundate the queen, for ſhe can lay and breed too though ſhe never ſee them. Their heat does not appear to me to be neceſſary for hatching the young, as they are moſtly hatched before any are bred in a hive: and when drones are in the hive, the weather is ſo warm, and ſo many common bees in it, that they appear to have rather too much heat, by their lying out of the hives often.

"I have many times had good hives with few or no drones in them all the year: and Keys is quite wrong when he ſays a top ſwarm will not do without drones in her; for I am poſitive to the contrary, as in the ſummer 1785 I took off four ſwarms of mine own in one day with not a ſingle drone in any of them, and they all throve well, and bred drones in themſelves about four weeks after.

"Although I cannot ſay what uſe the drones are of to a hive (unleſs it be to help away with a great deal of her honey, which they are very good at), yet the beſt hives have them ſooneſt in the year, they generally appearing in ſuch about the latter end of May, and the bees put a period to their lives about Lammas, at which time I give them all the aſſiſtance I can. The way they kill them is thus: They pull and bite them with their teeth, and ſting them alſo. I have ſeen great havoc made of them in one day, as appeared by their lying dead before the door of the hive. But their moſt effectual way of killing them is their baniſhing them from the honey-combs; upon which the drones betake themſelves to the under edges of the hives in great numbers, and to the board the hive ſtands on; and ſometimes, though rare, I have even ſeen them come to the outſide of the hive, and cluſter there about the bulk of a man's hand. When they are baniſhed thus, they are very dull and lifeleſs: and I have lifted up a hive from the board, and there they would have been ſitting cloſe on it, with ſcarcely three or four common bees among them; and I have trod to death 40 or more at a time.

"We may now take a view of the diſadvantages attending the old, and alſo Mr Debraw's principles on bees, were they true; and next ſee how a hive of bees may be preſerved from coming to ruin, according to my ſentiments on them.

"1. The old principles on bees ſay, that without a queen or royal cell be in a hive, it will come to ruin.

"2. Mr Debraw's principles ſay, that without little drones be in a hive it will come to ruin.

"3. I ſay, if a hive have only new laid eggs in her (which may be eaſily got the greateſt part of the year, in caſe ſhe have none of her own), and common bees, ſhe will find herſelf a queen, and ſo thrive.

"According to the old principles, it is eaſily ſeen that in caſe a hive loſe her queen when there is no royal cell in her, and no queen can be got to put to her (neither of which can be expected but in June and July), ſhe is entirely ruined.

"According to the Frenchman's ſcheme, there muſt be drones in a hive at all times of the year to fecundate the eggs, otherwiſe the hive is uſeleſs. Suppoſing his ſentiments to be true (which however can by no means be admitted, ſeeing there is no ſuch thing as little drones), how perplexed would the owner be to know when there were little drones in his hives! When he wanted to make an artificial ſwarm, he might bring off a queen and common bees with her: but how ſhould he come to know whether there were any, or a ſufficient quantity, of little drones among them, as they cannot be diſtinguiſhed from the commons but by immerſion and preſſure, which would be intolerably troubleſome, and next to killing the bees, and not at all practicable? All that could be done would be to hope the beſt, that there were little drones in her at any time of the year.

"I ſay, if a queen die in a hive, and that hive have ſome new-laid eggs in her, or ſome put to her, in caſe ſhe have none of her own, ſhe will nouriſh up ſome of theſe eggs to be a queen to herſelf: and alſo by taking out a queen and ſome commons out of a hive (without a ſingle drone, large or ſmall), and putting them in an empty hive, will make a ſwarm, and the old hive will breed herſelf a queen again if ſhe have eggs in her."

*Drone-Fly*, a two-winged inſect, extremely like the common drone-bee, whence alſo the name.

DROPS, in metereology, ſmall ſpherical bodies which the particles of fluids ſpontaneouſly form themſelves into when let fall from any height. This ſpherical figure, the Newtonian philoſophers demonſtrate to be the effect of corpuſcular attraction; for conſidering that the attractive force of one ſingle particle of a fluid is equally exerted to an equal diſtance, it muſt follow that other fluid particles are on every ſide drawn to it, and will therefore take their places at an equal diſtance from it, and conſequently form a round ſuperficies. See the articles ATTRACTION, FLUID, and RAIN.

DROPS, in medicine, a liquid remedy, the doſe of which is eſtimated by a certain number of drops.

*Engliſh* DROPS, *Guttæ Anglicanæ*, a name given to a chemical preparation eſteemed of great virtue againſt vapours and lethargic affections, and purchaſed at 5000l. by king Charles II. from the inventor Dr Goddard. The medicine appeared to be only a ſpirit drawn by the retort from raw ſilk, and afterwards rectified with oil of cinnamon, or any other eſſential oil; and was in reality no better than the common ſal volatile oleoſum, or any of the volatile ſpirits impregnated with an eſſential oil, except that it was leſs diſagreeable than any of them to the taſte.

DROPSY, in medicine, an unnatural collection of water in any part of the body. See (the *Index* ſubjoined to) MEDICINE.

DROPWORT, in botany. See FILIPENDULA.

*Water* DROPWORT, in botany. See OENANTHES.

DROSERA, ROS SOLIS, or *Sun-Dew*, in botany: A genus of the pentagynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 14th order, *Gruinales*. The calyx is quinquefid, the petals five; the capſule unilocular, and quinquevalved at top; the ſeeds very numerous. There are three ſpecies, which grow naturally in boggy places in many parts of the kingdom. They ſeem to receive the name of *ſun-dew* from a very ſtriking circumſtance in their appearance. The leaves, which are circular, are fringed with hairs ſupporting ſmall drops or globules of a pellucid liquor like dew, which continue even in the hotteſt part of the day and in the fulleſt expoſure to the ſun. The whole plant is acrid, and ſufficiently cauſtic to erode the ſkin: but ſome ladies know how to mix the juice with milk, ſo as to make it an innocent and ſafe application to remove freckles and ſun-burn. The juice that exſudes from it unmixed, will deſtroy warts and corns. The plant hath the ſame effect upon milk that the common butterwort hath; and like that too is ſuppoſed to occaſion the rot in ſheep.

DROWNING, ſignifies the extinction of life by a total immerſion in water.

In ſome reſpects, there ſeems to be a great ſimilarity between the death occaſioned by immerſion in water, and that by ſtrangulation, ſuffocation by fixed air, apoplexies, epilepſies, ſudden faintings, violent ſhocks of electricity, or even violent falls and bruiſes. Phyſicians, however, are not agreed with regard to the nature of the injury done to the animal ſyſtem in any or all of theſe accidents. It is indeed certain, that in all the caſes above mentioned, particularly in drowning, there is very often ſuch a ſuſpenſion of the vital powers as to us hath the appearance of a total extinction of them; while yet they may be again ſet in motion, and the perſon reſtored to life, after a much longer ſub-

ſubmerſion than hath been generally thought capable of producing abſolute death. It were to be wiſhed, however, that as it is now univerſally allowed that drowning is only a ſuſpenſion of the action of the vital powers, phyſicians could as unanimouſly determine the means by which theſe powers are ſuſpended; becauſe on a knowledge of theſe means, the methods to be uſed for recovering drowned perſons muſt certainly depend.

Dr de Haen, who hath written a treatiſe on this ſubject, aſcribes this diverſity of opinion among the phyſicians to their being ſo ready to draw general concluſions from a few experiments. Some, having never found water in the lungs, have thought that it never was there; and others, from its preſence, have drawn a contrary concluſion. Some have aſcribed the death which happens in caſes of drowning, to that ſpecies of apoplexy which ariſes from a great fulneſs of the ſtomach. But this opinion our author rejects, becauſe in 13 dogs which he had drowned and afterwards diſſected, no ſigns of ſuch a fulneſs appeared. Another reaſon is drawn from the want of the common marks of apoplexy on the diſſection of the brain, and from the actual preſence of water in the lungs. He is of opinion, that the death of drowned perſons happens in conſequence of water getting into the lungs, and ſtopping the blood in the arteries. He then diſcuſſes the queſtion how far the blowing of air into the lungs is uſeful in recovering drowned people. If their death is to be aſcribed to the water entering the lungs, this practice, he obſerves, muſt be hurtful, as it will increaſe the preſſure on the blood-veſſels, or may even force the water into them; which, on the authority of Lewis's experiments, he alleges is poſſible. But, in ſpite of this reaſoning, he aſſerts, that from experience it has been found uſeful. He allows, that the practice of ſuſpending drowned people by the feet muſt be hurtful, by determining the blood too much to the head; but he obſerves, that remedies in ſome reſpects hurtful may be uſed when the advantages derived from them preponderate; and is of opinion, that the practice above mentioned may be uſeful by agitating the viſcera againſt each other, and thus renewing their motions. Cutting the larynx in order to admit air more freely to the lungs, he reckons to be of little or no uſe; but acknowledges, however, that it may ſometimes prove beneficial on account of the irritation occaſioned by the operation.

Dr Cullen, in his Letter to Lord Cathcart concerning the recovery of perſons drowned and ſeemingly dead, tells us, that "From the diſſection of drowned men, and other animals, it is known, that very often the water does not enter into the cavity of the lungs, nor even into the ſtomach, in any quantity to do hurt to the ſyſtem; and, in general, it is known, that, in moſt caſes, no hurt is done to the organization of the vital parts. It is therefore probable, that the death which enſues, or ſeems to enſue, in drowned perſons, is owing to the ſtoppage of reſpiration, and to the ceaſing, in conſequence, of the circulation of the blood, whereby the body loſes its heat, and, with that, the activity of the vital principle."

In the Phil. Tranſ. Vol. LXVI. Mr Hunter gives the following theory. The loſs of motion in drowning, ſeems to ariſe from the loſs of reſpiration; and the immediate effect this has upon the other vital motions of the animal, at leaſt this privation of breathing, appears to be the firſt cauſe of the heart's motion ceaſing. It is moſt probable, therefore, Mr Hunter obſerves, that the reſtoration of breathing is all that is neceſſary to reſtore the heart's motion; for if a ſufficiency of life ſtill remains to produce that effect, we may ſuppoſe every part equally ready to move the very inſtant in which the action of the heart takes place, their actions depending ſo much upon it. What makes it very probable, that the principal effect depends upon throwing air into the lungs, is, that children in the birth, when too much time has been ſpent after the loſs of that life which is peculiar to the fetus, loſe altogether the diſpoſition for the new life. In ſuch caſes there is a total ſuſpenſion of the actions of life; the child remains to all appearance dead; and would die, if air was not thrown into its lungs, and the firſt principle of action by that means reſtored. To put this in a clearer light, Mr Hunter gives the reſult of ſome experiments made on a dog in 1755.—A pair of double bellows were provided, which were ſo conſtructed, that by one action air was thrown into the lungs, and by the other the air was ſucked out which had been thrown in by the former, without mixing them together. The muzzle of theſe bellows was fixed into the trachea of a dog, and by working them he was kept perfectly alive. While this artificial breathing was going on, the ſternum was taken off, ſo that the heart and lungs were expoſed to view. The heart then continued to act as before, only the frequency of its action was greatly increaſed. Mr Hunter then ſtopped the motion of the bellows; and obſerved that the contraction of the heart became gradually weaker and leſs frequent, till it left off moving altogether; but by renewing the operation, the motion of the heart alſo revived, and ſoon became as ſtrong and frequent as before. This proceſs was repeated upon the ſame dog ten times; ſometimes ſtopping for five, eight, or ten minutes. Mr Hunter obſerved, that every time he left off working the bellows, the heart became extremely turgid with blood, and the blood in the left ſide became as dark as that in the right, which was not the caſe when the bellows were working. Theſe ſituations of the animal, he obſerves, ſeem to be exactly ſimilar to drowning.

Dr Edmund Goodwyn, in a treatiſe lately publiſhed on this ſubject, has endeavoured to aſcertain the effects of ſubmerſion upon living animals in a more accurate manner than had hitherto been done. His firſt care was to determine the ſymptoms which took place before death; and to obſerve theſe, he procured a large glaſs bell in which the animals were to be immerſed. Having inverted, and filled this with water, he put into it ſeveral cats, dogs, rabbits, and ſmaller animals, confining them among the water till they were apparently dead. In theſe experiments he obſerved, that immediately after ſubmerſion the pulſe became weak and frequent; there was an apparent anxiety about the breaſt, and ſtruggling to relieve it. In theſe ſtruggles the animal roſe to the top of the water, throwing out a quantity of air from the lungs. After this the anxiety increaſes, the pulſe becomes weaker, and the ſtruggles more violent; he riſes again to the ſurface, throws out more air from the lungs, and in his efforts

Drowning. to inſpire. a quantity of water commonly paſſes into the mouth. The ſkin about the face and lips then becomes blue, the pulſe ceaſes, the ſphincters are relaxed, and the animal falls down without ſenſe or motion. On diſſecting the bodies of drowned animals, our author met with the following appearances: 1. The external ſurface of the brain was darker, but the veſſels of it were not more turgid than uſual, nor was there any appearance of extravaſation. 2. The pulmonary arteries and veins were filled with black blood, and the lungs themſelves contained ſome frothy liquid. 3. Notwithſtanding theſe ſymptoms, the right auricle and ventricle were ſtill contracting and dilating; the left ſinus venoſus and auricle moving feebly, but the left ventricle at reſt. 4. The right and left auricles of the heart, the right ventricle, and the left ſinus venoſus, were filled with black blood; but the laſt ventricle only half filled with the ſame, and a quantity of the ſame black blood was alſo contained in the ſmaller branches of the arteries proceeding from the left ventricle.

This inveſtigation was followed by a moſt careful and ingenious inquiry concerning the cauſes of the ſymptoms already related. To find out whether or not the entrance of water into the lungs was the cauſe, or whether water really entered the lungs in theſe caſes or not, he drowned ſeveral animals among ink; and by inſpecting their bodies, found, that though water really did enter, it was in ſuch ſmall quantity that it could not be ſuppoſed capable of producing ſuch violent effects. To aſcertain this, however, more exactly than could be done by the ink, he drowned other animals in quickſilver; which, by reaſon of its not being miſcible with the animal fluids, could be more accurately collected. By theſe it appeared that no more than five drachms of the fluid in which a cat was immerſed entered her lungs in the time of drowning; and to determine whether or not this could be the occaſion of the animal's death, he made the following experiment: Having confined a cat in an erect poſture, he made a ſmall opening in the trachea, by cutting one of the cartilaginous rings; and through this opening he introduced two ounces of water into the lungs. The only conſequences were a difficulty of breathing and weak pulſe; but theſe ſoon abated, and it lived ſeveral hours afterwards without any apparent inconvenience. On ſtrangling it he found two ounces and a half of water in the lungs. On repeating the experiment with other fluids, he found the difficulty of breathing and alteration in the pulſe ſomewhat greater: but in theſe inſtances alſo they abated in a few hours; and when the animals were ſtrangled, the lungs were found to contain four ounces of fluid.

From all theſe experiments Dr Goodwyn draws the following concluſions: 1. "A ſmall quantity of fluid uſually paſſes into the lungs in drowning. 2. This water enters the lungs during the efforts to inſpire; and mixing with the pulmonary mucus, occaſions the frothy appearance mentioned by authors. 3. The whole of this fluid in the lungs is not ſufficient to produce the changes that take place in drowning. And hence it follows, that the water produces all the changes that take place in drowning *indirectly*, by excluding the atmoſpheric air from the lungs." This naturally leads to an inveſtigation of the uſes of reſpiration, and the effects of the air upon the blood and lungs in that action, which our author traces with great accuracy and very convincing experiments. He begins with attempting to determine the quantity of air drawn in at each inſpiration, with the proportional quantity left after expiration. The experiments by which he endeavoured to aſcertain theſe quantities ſeem to be more uncertain than the others, as indeed there are not data ſufficient for them. From ſuch as he had an opportunity of making, however, the following concluſions were deduced: 1. "The lungs contain 109 cubic inches of air after a complete expiration; and this quantity receives an additional quantity of 14 cubic inches during each inſpiration. 2. The dilatation of the lungs after expiration is to their dilatation after inſpiration as 109 to 123. 3. The blood circulates through the pulmonary veſſels in all the degrees of natural reſpiration. 4. The circulation through them, after expiration, is ſufficiently free to keep up the health of the ſyſtem."

The laſt part of our author's inquiry, *viz.* concerning the chemical changes produced in the air by reſpiration, and the effects of the air upon the blood itſelf, falls naturally to be conſidered under the article RESPIRATION: ſo that here we ſhall only obſerve in general, that his experiments evidently ſhow that the diſeaſe produced by drowning ariſes entirely from the excluſion of the atmoſpheric air or its dephlogiſticated part; for which reaſon he recommends inflating the lungs with that kind of air in preference to any other.

From theſe different views of this matter, phyſicians have differed conſiderably in their account of the methods to be followed in attempting the recovery of drowned perſons. De Haen recommends agitation of all kinds; every kind of ſtimulus applied to the mouth, noſe, and rectum; bleeding; heat, both by warm cloths and warm water; blowing air into the trachea; ſtimulants, ſuch as bliſters, warm aſhes, &c. applied to the head, ankles, thighs, pit of the ſtomach, and other parts.

Doctor Cullen's obſervations on this ſubject are as follow.—"With reſpect to the particular means to be employed for the recovery of drowned perſons, it is to be obſerved, in the firſt place, That ſuch as were recommended and practiſed, upon a ſuppoſition that the ſuffocation was occaſioned by the quantity of water taken into the body, and therefore to be evacuated again, were very unhappily adviſed. The hanging up of perſons by the heels, or ſetting them upon the crown of the head, or rolling the body upon a caſk, were generally practiſed, upon a ſuppoſition altogether falſe; or upon the ſuppoſition of a caſe which, if real, is apprehended to be irrecoverable. At the ſame time, theſe practices were always attended with the danger of burſting ſome veſſels in the brain or lungs, and of rendering thereby ſome caſes incurable that were not ſo from the drowning alone. All ſuch practices, therefore, are now very properly diſapproved of and forbid.

"In thoſe caſes in which the body has not been long in the water, and in which therefore the natural heat is not entirely extinguiſhed, nor the irritability of the moving fibres very greatly impaired, it is poſſible that a good deal of agitation of the body may be the only means neceſſary to reſtore the action of the vital organs; but in other caſes, where the heat and irritability have ceaſed to a greater degree, it is to me very doubtful, if much agitation can be ſafe, and if any degree of it can be uſeful, till the heat and irritability are in ſome meaſure reſtored. In all caſes, any violent concuſſion cannot be ſafe, and, I believe, is never neceſſary. It may be proper here to obſerve alſo, that in tranſporting the body from the place where it is taken out of the water, to the place where it may be neceſſary for applying the proper means of its recovery, all poſtures expoſing to any improper compreſſion, as that of the body's being carried over a man's ſhoulder, are to be avoided. The body is to be kept ſtretched out, with the head and upper parts a little raiſed; and care is to be taken to avoid the neck's being bent much forward. In this manner, laid upon one ſide, and upon ſome ſtraw in a cart, it may be moſt properly conveyed; and the agitation which a pretty briſk motion of the cart may occaſion, will, in moſt caſes, do no harm.

" From the account I have given above of the cauſes, or of the appearances, of death, in drowned perſons, it is evident, that the firſt ſtep to be taken for their recovery is to reſtore the heat of the body, which is abſolutely neceſſary to the activity of the moving fibres. For this purpoſe, the body, as ſoon as poſſible, is to be ſtripped of its wet clothes, to be well dried, and to be wrapped up in dry, and (if poſſible) warm, coverings: and it is to be wiſhed, in all caſes, as ſoon as the report of a perſon's being drowned is heard, that blankets ſhould be immediately carried to the water-ſide; ſo that, as ſoon as the body is got out of the water, the change of covering juſt now mentioned may be inſtantly made; or, if the body has been naked when drowned, that it may be immediately dried, and defended againſt the cold of the air. Beſides covering the body with blankets, it will be further of advantage, if it can be done without loſe of time, to cover the drowned body with a warm ſhirt or waiſtcoat immediately taken from a living perſon.

" When, at the time of a perſon's being drowned, it happens that the ſun ſhines out very hot, I think there can be no better means of recovering the heat, than by expoſing the naked body, in every part, to the heat of the ſun; while, at the ſame time, all other means neceſſary or uſeful for the recovery of life are alſo employed.

" When the heat of the ſun cannot be employed, the body ſhould be immediately tranſported to the neareſt houſe that can be got convenient for the purpoſe: the fitteſt will be one that has a tolerably large chamber, in which a fire is ready, or can be made; and if poſſible, the houſe ſhould afford another chamber, in which alſo a fire can be provided.

" When the drowned body is brought into ſuch houſe, and care is at the ſame time taken that no more people are admitted than are abſolutely neceſſary to the ſervice of the drowned perſon, every endeavour muſt be immediately employed for recovering the heat of the body, and that by different meaſures, as circumſtances ſhall direct.

" If, in the neighbourhood of the place, there be any brewery, diſtillery, dyery, or fabric which gives an opportunity of immediately obtaining a quantity of warm water and a convenient veſſel, there is nothing more proper than immerſing the body in a warm bath. Even where a ſufficient quantity of warm water cannot be had at once, the bath may be ſtill practiſed, if the accident has happened in or very near a town or village, when a great many fires may be at once employed in heating ſmall quantities of water; for in this way the neceſſary quantity may be ſoon obtained. To encourage this practice, it is to be obſerved, that one part of boiling water is more than ſufficient to give the neceſſary heat to two parts of ſpring or ſea water, as it is not proper to apply the bath at firſt very warm, nor even of the ordinary heat of the human body, but ſomewhat under it; and, by the addition of warm water, to bring it gradually to a heat very little above it.

" If the drowned body be of no great bulk, it may be conveniently warmed by a perſon's lying down in bed with it, and taking it near to their naked body, changing the poſition of it frequently, and at the ſame time chaffing and rubbing with warm cloths the parts which are not immediately applied to their warm body.

" If none of theſe meaſures can be conveniently practiſed, the body is to be laid upon a bed before a moderate fire, and frequently turned, to expoſe the different parts of it; and thus, by the heat of the fire gradually applied, and by rubbing the body well with coarſe towels, or other cloths well warmed, pains are to be taken for reſtoring its heat. This will be promoted by warm cloths applied and frequently renewed under the hams and arm-pits; and by hot bricks, or bottles of warm water, laid to the feet.

" In the practice of rubbing, it has been propoſed to moiſten the cloths applied with camphorated ſpirits, or other ſuch ſtimulating ſubſtances: but I think this muſt prove an impediment to the rubbing; and I would not recommend any practice of this kind, except, perhaps, the application of the vinous ſpirit of ſal ammoniac to the wriſts and ankles only.

" For recovering the heat of the body, it has been propoſed to cover it all over with warm grains, aſhes, ſand, or ſalt; and where theſe, ſufficiently warm, are ready at hand, they may be employed; but it is very ſeldom they can be obtained, and the application might often interfere with other meaſures that may be neceſſary. All therefore that I can propoſe, with reſpect to the uſe of theſe, is to obſerve, that bags of warm and dry ſalt may be amongſt the moſt convenient applications to the feet and hands of drowned perſons; and the quantity neceſſary for this purpoſe may be got pretty quickly by heating the ſalt in a frying-pan over a common fire.

" While theſe meaſures are taking for recovering the heat, means are at the ſame time to be employed for reſtoring the action of the moving fibres. It is well known, that the inteſtines are the parts of the body which, both from their internal ſituation and peculiar conſtitution, retain the longeſt their irritability; and therefore, that, in drowned perſons, ſtimulants applied may have more effect upon the inteſtines than upon other parts. The action, therefore, of the inteſtines is to be ſupported or renewed as ſoon as poſſible; as the reſtoring and ſupporting the action of ſuch a conſiderable portion of moving fibres as thoſe of the inteſtines, muſt contribute greatly to reſtore the activity of the whole ſyſtem.

"For exciting the action of the inteſtines, the moſt proper mean is, the application of their ordinary ſtimulus of dilatation; and this is moſt effectually applied, by forcing a quantity of the air into them by the fundament. Even the throwing in cold air has been found uſeful: but it will certainly be better if heated air can be employed; and further, if that air can be impregnated with ſomething which, by its acrimony alſo, may be powerful in ſtimulating the inteſtines.

"From all theſe conſiderations, the ſmoke of burning tobacco has been moſt commonly applied, and has upon many occaſions proved very effectual. This will be moſt properly thrown in by a particular apparatus, which, for other purpoſes as well as this, ſhould be in the hands of every ſurgeon; or at leaſt ſhould, at the public expence, be at hand in every part of the country where drownings are likely to happen. With regard to the uſe of it, I have to obſerve, that till the tobacco is kindled in a conſiderable quantity, a great deal of cold air is blown through the box and tube; and as that, as hinted above, is not ſo proper, care ſhould be taken to have the tobacco very well kindled, and to blow through it very gently, till the heated ſmoke only paſſes through. If, upon certain occaſions, the apparatus referred to ſhould not be at hand, the meaſure however may be executed by a common tobacco pipe, in the following manner: A common glyſter-pipe that has a bag mounted upon it, is to be introduced into the fundament, and the mouth of the bag is to be applied round the ſmall end of a tobacco-pipe. In the bowl of this, tobacco is to be kindled; and, either by a playing card made into a tube and applied round the mouth of the bowl, or by applying upon this the bowl of another pipe that is empty, and blowing through it, the ſmoke may be thus forced into the inteſtines, and, in a little time, in a conſiderable quantity.

"If none of theſe means for throwing in the ſmoke can be employed, it may be uſeful to inject warm water to the quantity of three or four Engliſh pints. This may be done by a common glyſter-bag and pipe, but better by a large ſyringe; and it may be uſeful to diſſolve in the water ſome common ſalt, in the proportion of half an ounce to an Engliſh pint; and alſo, to add to it ſome wine or brandy.

"While theſe meaſures for recovering the heat of the body and the activity of the moving fibres are employed, and eſpecially after they have been employed for ſome time, pains are to be taken to complete and finiſh the buſineſs, by reſtoring the action of the lungs and heart.

"On this ſubject, I am obliged to my learned and ingenious colleague Dr Monro, who has made ſome experiments for aſcertaining the beſt manner of inflating the lungs of drowned perſons. By theſe experiments he finds it may be more conveniently done by blowing into one of the noſtrils, than by blowing into the mouth. For blowing into the noſtril, it is neceſſary to be provided with a wooden pipe, fitted at one extremity for filling the noſtril, and at the other for being blown into by a perſon's mouth, or for receiving the pipe of a pair of bellows, to be employed for the ſame purpoſe. Doctor Monro finds, that a perſon of ordinary ſtrength can blow into ſuch a pipe, with a ſufficient force to inflate the lungs to a conſiderable degree; and thinks the warm air from the lungs of a living perſon will be moſt conveniently employed at firſt; but when it is not ſoon effectual in reſtoring the reſpiration of the drowned perſon, and that a longer continuance of the inflation is neceſſary, it may be proper to employ a pair of bellows, large enough at once to contain the quantity of air neceſſary to inflate the lungs to a due degree.

"Whether the blowing-in is done by a perſon's mouth, or by bellows, Dr Monro obſerves, that the air is ready to paſs by the gullet into the ſtomach; but that this may be prevented, by preſſing the lower part of the larynx backwards upon the gullet. To perſons of a little knowledge in anatomy, it is to be obſerved, that the preſſure ſhould be only upon the cricoid cartilage, by which the gullet may be ſtraitened, while the paſſage through the larynx is not interrupted.

"When, by blowing thus into the noſtril, it can be perceived, by the raiſing of the cheſt or belly, that the lungs are filled with air, the blowing in ſhould ceaſe; and by preſſing the breaſt and belly, the air received into the lungs ſhould be again expelled; then the blowing and expulſion ſhould be again repeated; and thus the practice is to be continued, ſo as to imitate, as exactly as poſſible, the alternate motions of natural reſpiration.

"It is hardly neceſſary to obſerve, that when the blowing into the noſtril is practiſed, the other noſtril and the mouth ſhould be accurately cloſed.

"If it ſhould happen that in this practice the air does not ſeem to paſs readily into the lungs, Doctor Monro informs me it is very practicable to introduce directly into the glottis and trachea a crooked tube, ſuch as the catheter uſed for a male adult. For this he offers the following directions: The ſurgeon ſhould place himſelf on the right ſide of the patient; and, introducing the forefinger of his left hand at the right corner of the patient's mouth, he ſhould puſh the point of it behind the epiglottis; and uſing this as a directory, he may enter the catheter, which he holds in his right hand, at the left corner of the patient's mouth, till the end of it is paſſed beyond the point of his forefinger; and it is then to be let fall, rather than puſhed into the glottis; and through this tube, by a proper ſyringe applied to it, air may be with certainty blown into the lungs. I obſerve, that ſome ſuch meaſure had been propoſed by Monſ. le Cat in France; but I have not learned that it has ever been put in practice, and I am afraid it may be attended with ſeveral difficulties, and muſt be left to the diſcretion of ſurgeons, who may be properly provided and inſtructed for this purpoſe.

"For throwing air with more certainty into the lungs, it has been propoſed to open the windpipe in the ſame manner as is done in the operation which the ſurgeons call *bronchotomy*, and by this opening to blow into the lungs; and when the blowing into the noſtril does not ſeem to ſucceed, and a ſkilful operator is at hand, I allow that the meaſure may be tried; but I can hardly ſuppoſe, that it will be of any advantage when the blowing in by the noſtril has entirely failed.

"It is to be hoped, that by blowing into the lungs one way or other, even a quantity of water which had been

been taken into the lungs may be again waſhed out; and the ſame ſeems to be the only effectual means of waſhing out that frothy matter which is found to fill the lungs of drowned perſons, and which proves, if I miſtake not, the moſt common cauſe of their mortal ſuffocation. This practice, therefore, is to be immediately entered upon, and very aſſiduouſly continued for an hour or two together.

"I have now mentioned the meaſures chiefly to be purſued and depended upon for the recovery of drowned perſons; but muſt ſtill mention ſome others that may prove conſiderable helps to it.

"One of theſe is, the opening the jugular veins to relieve the congeſtion, which almoſt conſtantly occurs in the veins of the head, and is probably a frequent cauſe of the death of drowned perſons. For relieving this congeſtion, the drawing ſome blood from the jugulars, very early, may certainly be of ſervice; and it will be particularly indicated by the livid and purple colour of the face. It may even be repeated, according to the effect it ſeems to have in taking off that ſuffuſion; but when the drowned perſon is in ſome meaſure recovered, and ſome motion of the blood is reſtored, it will be proper to be very cautious in making this evacuation, and at leaſt to take care not to puſh it ſo far as to weaken too much the recovering, but ſtill weak, powers of life.

"Another meaſure for recovering the activity of the vital principle, is the application of certain ſtimulants to the more ſenſible parts of the body, ſuch as holding the quick-lime ſpirit of ſal ammoniac to the noſe, or putting a little of it upon a rag into the noſtrils. It has been uſual to pour ſome liquids into the mouth; but it is dangerous to pour in any quantity of liquid, till it appear that the power of ſwallowing is in ſome meaſure reſtored.

"When a ſurgeon is at hand, and is provided with proper apparatus, a crooked pipe may be introduced into the gullet; and by this a gill or two of warm wine may be poured down into the ſtomach, and probably with advantage. But when no ſuch apparatus is at hand, or ſurgeon to employ it, and the power of ſwallowing is ſtill doubtful, the trial of pouring liquids into the mouth ſhould be made by a ſmall quantity of warm water alone; and when, from ſuch trial, the power of ſwallowing ſhall appear to be recovered, it may then be allowable to favour the further recovery of the perſon, by pouring in ſome wine or brandy.—In ſhort, till ſome marks of the recovery of ſwallowing and reſpiration appear, it will not be ſafe to apply any ſtimulants to the mouth; excepting that of a few drops of ſome acrid ſubſtance to the tongue, and which are not of bulk enough to ſlide back upon the glottis: I can think of no ſtimulant more conveniently and ſafely to be applied to the mouth and noſtrils, than a moderate quantity of tobacco-ſmoke blown into them.

"Though I do not imagine that drowned perſons are ever hurt by the quantity of water taken into their ſtomach, yet, as a ſtimulus applied to the ſtomach, and particularly as the action of vomiting proves a ſtimulus to the whole ſyſtem, I can have no objection to the French practice of throwing in an emetic as ſoon as any ſwallowing is reſtored. For this purpoſe, I would ſucceſſively throw in ſome tea-ſpoonfuls of the ipecacuanha wine; and when it does not interfere with other neceſſary meaſures, the fauces may be gently irritated by an oiled feather thruſt into them.

"With regard to the ſtimulants, I muſt conclude with obſerving, That when a body has lain but for a ſhort time in the water, and that therefore its heat and irritability are but little impaired, the application of ſtimulants alone has been often found effectual for the recovery: but, on the contrary, when the body has lain long in the water, and the heat of it is very much extinguiſhed, the application of any other ſtimulants than that of tobacco-ſmoke to the inteſtines can be of very little ſervice; and the application of others ought never to interfere with the meaſures for recovering heat and the motion of reſpiration.

"With reſpect to the whole of theſe practices, I expect, from the principles upon which they are in general recommended, it will be underſtood, that they are not to be ſoon diſcontinued, though their effects do not immediately appear. It is obvious, that, in many caſes, it may be long before the heat of the body, and the activity of the vital principle, can be reſtored, although, in a longer time, it may very poſſibly be accompliſhed. In fact, it has often happened, that tho' means employed for one hour have not ſucceeded, the ſame continued for two or more hours, have at length had the wiſhed for effects. It ſhould therefore be a conſtant rule, in this buſineſs, that the proper means ſhould be employed for ſeveral hours together; unleſs it happen, that, while no ſymptoms of returning life appear, the ſymptoms of death ſhall, at the ſame time, go on conſtantly increaſing.

"In the whole of the above I have kept in view chiefly the caſe of drowned perſons: but it will be obvious, that many of the meaſures propoſed will be equally proper and applicable in other caſes of ſuffocation; as thoſe from ſtrangling, the damps of mines, the fumes of charcoal, &c.; and a little attention to the difference of circumſtances will lead to the meaſures moſt proper to be employed."

Mr Hunter, in the before-mentioned paper, differs pretty conſiderably from De Haen and Dr Cullen. He obſerves, that when aſſiſtance is ſoon called in after immerſion, blowing air into the lungs will in ſome caſes effect a recovery; but when any conſiderable time has been loſt, he adviſes ſtimulant medicines, ſuch as the vapour of volatile alkali, to be mixed with the air; which may eaſily be done, by holding ſpirits of hartſhorn in a cup under the receiver of the bellows. And, as applications of this kind to the olfactory nerves tend greatly to rouſe the living principle, and put the muſcles of reſpiration into action, it may probably, therefore, be moſt proper to have air impregnated in that manner thrown in by the noſe. To prevent the ſtomach and inteſtines from being too much diſtended by the air ſo injected, the larynx is directed to be gently preſſed againſt the œſophagus and ſpine.

While this buſineſs is going on, an aſſiſtant ſhould prepare bed-cloaths, carefully brought to a proper degree of heat. Heat our author conſiders as congenial with the living principle; increaſing the neceſſity of action, it increaſes action; cold, on the other hand, leſſens the neceſſity, and of courſe the action is diminiſhed: to a due degree of heat, therefore, the living principle, he thinks, owes its vigour. From experiments, he ſays, it appears to be a law in animal bodies, that the degree of heat ſhould bear a proportion to the quantity of life; as life is weakened, this proportion requires great accuracy, while greater powers of life allow it greater latitudes.

After theſe and ſeveral other obſervations on the ſame ſubject, our author proceeds to more particular directions for the management of drowned people.

If bed-cloaths are put over the perſon, ſo as ſcarce to touch him, ſteams of volatile alkali, or of warm balſams, may be thrown in, ſo as to come in contact with many parts of the body. And it might probably be advantageous, Mr Hunter obſerves, to have ſteams of the ſame kind conveyed into the ſtomach. This, we are told, may be done by a hollow bougie and a ſyringe; but the operation ſhould be very ſpeedily performed, as the inſtrument, by continuing long in the mouth, might produce ſickneſs, which our author ſays he would always wiſh to avoid.

Some of the warm ſtimulating ſubſtances, ſuch as juice of horſe-radiſh, peppermint water, and ſpirits of hartſhorn, are directed to be thrown into the ſtomach in a fluid ſtate, as alſo to be injected by the anus. Motion poſſibly may be of ſervice; it may at leaſt be tried: but as it hath leſs effect than any other of the uſually preſcribed ſtimuli, it is directed to be the laſt part of the proceſs.

The ſame care in the operator, in regulating the proportion of every one of theſe means, is here directed, as was formerly given for the application of heat. For every one of them, our author obſerves, may poſſibly have the ſame property of deſtroying entirely the feeble action which they have excited, it adminiſtered in too great a quantity: inſtead, therefore, of increaſing and haſtening the operations on the firſt ſigns of returning life being obſerved, as is uſually done, he deſires they may be leſſened; and adviſes their increaſe to be afterwards proportioned, as nearly as poſſible, to the quantity of powers as they ariſe.

When the heart begins to move, the application of air to the lungs ſhould be leſſened, that, when the muſcles of reſpiration begin to act, a good deal may be left for them to do.

Mr Hunter abſolutely forbids blood-letting in all ſuch caſes; for, as it not only weakens the animal principle, but leſſens life itſelf, it muſt conſequently, he obſerves, leſſen both the powers and diſpoſitions to action. For the ſame reaſon, he is againſt introducing any thing into the ſtomach that might produce ſickneſs or vomiting; and, on the ſame principle, he ſays, we ſhould avoid throwing tobacco fumes, or any other ſuch articles, up by the anus, as might tend to an evacuation that way.

The following is a deſcription of inſtruments recommended for ſuch operations by our author.

*Firſt*, A pair of bellows, ſo contrived, with two ſeparate cavities, that, by opening them when applied to the noſtrils or mouth of a patient, one cavity will be filled with common air, and the other with air ſucked out from the lungs, and by ſhutting them again, the common air will be thrown into the lungs, and that ſucked out of the lungs diſcharged into the room. The pipe of theſe ſhould be flexible; in length a foot, or a foot and an half; and, at leaſt, three eighths of an inch in width. By this the artificial breathing may be continued, while the other operations, the application of the ſtimuli to the ſtomach excepted, are going on, which could not be conveniently done if the muzzle of the bellows were introduced into the noſe. The end next the noſe ſhould be double, and applied to both noſtrils. *Secondly*, A ſyringe, with a hollow bougie, or flexible catheter, of ſufficient length to go into the ſtomach, and convey any ſtimulating matter into it, without affecting the lungs. *Thirdly*, A pair of ſmall bellows, ſuch as are commonly uſed in throwing fumes of tobacco up by the anus.

Notwithſtanding the differences in theory, however, between the phyſicians above mentioned, it is certain, that within theſe few years great numbers of drowned people have been reſtored to life by a proper uſe of the remedies we have enumerated, and ſocieties for the recovery of drowned perſons have been inſtituted in different places. The firſt ſociety of this kind was inſtituted in Holland, where, from the great abundance of canals and inland ſeas, the inhabitants are particularly expoſed to accidents by water. In a very few years 150 perſons were ſaved from death by this ſociety; and many of theſe had continued upwards of an hour without any ſigns of life, after they had been taken out of the water. The ſociety was inſtituted at Amſterdam in 1767: and, by an advertiſement, informed the inhabitants of the United Provinces of the methods proper to be uſed on ſuch occaſions; offering rewards at the ſame time to thoſe who ſhould, with or without ſucceſs, uſe thoſe methods for recovering perſons drowned and ſeemingly dead. The laudable and humane example of the Dutch was followed in the year 1768 by the magiſtrates of health in Milan and Venice; afterwards by the magiſtrates of Hamburg in the year 1771, by thoſe of Paris in the year 1772, and by the magiſtrates of London in 1774.

The following directions are given for the recovery of drowned perſons by the ſociety at London.

I. As ſoon as the patient is taken out of the water, the wet cloaths, if the perſon is not naked at the time of the accident, ſhould be taken off with all poſſible expedition on the ſpot (unleſs ſome convenient houſe be very near), and a great-coat or two, or ſome blankets if convenient, ſhould be wrapped round the body.

II. The patient is to be thus carefully conveyed in the arms of three or four men, or on a bier, to the neareſt public or other houſe, where a good fire, if in the winter ſeaſon, and a warm bed, can be made ready for its reception. As the body is conveying to this place, great attention is to be paid to the poſition of the head; it muſt be kept ſupported in a natural and eaſy poſture, and not ſuffered to hang down.

III. In cold or moiſt weather, the patient is to be laid on a matraſs or bed before the fire, but not too near, or in a moderately heated room: in warm and ſultry weather, on a bed only. The body is then to be wrapped as expeditiouſly as poſſible with a blanket, and thoroughly dried with warm coarſe cloths or flannels.

IV. In ſummer or ſultry weather too much air cannot be admitted. For this reaſon it will be neceſſary to ſet open the windows and doors, as cool refreſhing air is of the greateſt importance in the proceſs of reſuſcitation.

V. Not more than ſix perſons are to be preſent to apply the proper means; a greater number will be uſeleſs, and may retard, or totally prevent, the reſtoration of life, by rendering the air of the apartment unwholeſome. It will be neceſſary, therefore, to requeſt the abſence of thoſe who attend merely from motives of curioſity.

VI. It will be proper for one of the aſſiſtants, with a pair of bellows of the common ſize, applying the pipe a little way up one noſtril, to blow with ſome force, in order to introduce air into the lungs; at the ſame time the other noſtril and the mouth are to be cloſed by another aſſiſtant, whilſt a third perſon gently preſſes the cheſt with his hands, after the lungs are obſerved to be inflated. By purſuing this proceſs, the noxious and ſtagnant vapours will be expelled, and natural breathing imitated. If the pipe of the bellows be too large, the air may be blown in at the mouth, the noſtrils at the ſame time being cloſed, ſo that it may not eſcape that way: but the lungs are more eaſily filled, and natural breathing better imitated, by blowing up the noſtril.

VII. Let the body be gently rubbed with common ſalt, or with flannels, ſprinkled with ſpirits, as rum or geneva (A). A warming-pan heated (the body being ſurrounded with flannel) may be lightly moved up and down the back. Fomentations of hot brandy are to be applied to the pit of the ſtomach, loins, &c. and often renewed. Bottles filled with hot water, heated tiles covered with flannel, or hot bricks, may be efficaciouſly applied to the ſoles of the feet, palms of the hands, and other parts of the body. The temples may be rubbed with ſpirits of hartſhorn, and the noſtrils now and then tickled with a feather; and ſnuff, or *eau de luce*, ſhould be occaſionally applied.

VIII. Tobacco fumes ſhould be thrown up the fundament; if a fumigator be not at hand, the common pipe may anſwer the purpoſe. The operation ſhould be frequently performed, as it is of importance; for the good effects of this proceſs have been experienced in a variety of inſtances of ſuſpended animation. But ſhould the application of tobacco-ſmoke in this way not be immediately convenient, or other impediments ariſe, clyſters of this herb, or other acrid infuſions with ſalt, &c. may be thrown up with advantage.

IX. When theſe means have been employed a conſiderable time without ſucceſs, and any brewhouſe or warm bath can be readily obtained, the body ſhould be carefully conveyed to ſuch a place, and remain in the bath, or ſurrounded with warm grains, for three or four hours.

If a child has been drowned, its body ſhould be wiped perfectly dry, and immediately placed in bed between two healthy perſons. The ſalutary effects of the natural vital warmth, conveyed in this manner, have been proved in a variety of ſucceſsful caſes.

X. While the various methods of treatment are employed, the body is to be well ſhaken every ten minutes, in order to render the proceſs of animation more certainly ſucceſsful; and children, in particular, are to be much agitated, by taking hold of their legs and arms frequently and for a continuance of time. In various inſtances agitation has forwarded the recovery of boys who have been drowned, and continued for a conſiderable time apparently dead.

XI. If there be any ſigns of returning life, ſuch as ſighing, gaſping, or convulſive motions, a ſpoonful of any warm liquid may be adminiſtered; and if the act of ſwallowing is returned, then a cordial of warm brandy or wine may be given in ſmall quantities and frequently repeated.

XII. Electricity may be tried by the judicious and ſkilful, as its application neither prevents nor retards the various modes of recovery already recommended; but, on the other hand, will moſt probably tend to render the other means employed more certainly and more expeditiouſly efficacious. This ſtimulus bids fair to prove an important auxiliary in caſes of ſuſpended animations; and therefore deſerves the ſerious regard and attention of the Faculty.

The methods which have been fully deſcribed, are to be employed with vigour for three hours or upwards, although no favourable circumſtances ſhould ariſe; for it is a vulgar and dangerous opinion to ſuppoſe that perſons are irrecoverable, becauſe life does not ſoon make its appearance; an opinion that has conſigned to the grave an immenſe number of the ſeemingly dead, who might have been reſtored to life by reſolution and perſeverance.

Bleeding is never to be employed in ſuch caſes, unleſs by the direction of one of the medical aſſiſtants, or ſome other gentleman of the faculty who has paid attention to the reſuſcitating art.

DRUG, a general term for goods of the druggiſt and grocery kinds, eſpecially thoſe uſed in medicine and dyeing. See MATERIA MEDICA, PHARMACY, and DYEING.

DRUGGET, in commerce, a ſtuff ſometimes all wool, and ſometimes half wool half thread, ſometimes corded, but uſually plain. Thoſe that have the woof of wool, and the warp of thread, are called *threaded druggets*; and thoſe wrought with the ſhuttle on a loom of four marches, as the ſerges of Moui, Beauvois, and other like ſtuffs corded, are called *corded druggets*. As to the plain, they are wrought on a loom of two marches, with the ſhuttle, in the ſame manner as cloth, camblets, and other like ſtuffs not corded.

DRUIDÆ, or DROIUM (anc. geog.), a very ancient town, the principal place of the Druides or Druidæ in Gaul, as they are called (Cæſar, Cicero). Now *Dreux* in the Orleannois. Here they met every year in a conſecrated grove, according to Cæſar. The town was alſo called *Durocaſes*. W. Long. 1. 21. Lat. 48. 45.

DRUIDS, DRUIDES, or DRUIDÆ, the prieſts or miniſters of religion among the ancient Celtæ or Gauls, Britons, and Germans.

Some authors derive the word from the Hebrew דרושים *deruſſim*, or *druſſim*, which they tranſlate *contemplatores*. Picard, Celtopæd. lib. ii. p. 58. believes the druids to have been thus called from *Druis*, or *Dryius*, their leader, the fourth or fifth king of the Gauls,

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(A) Dr Fothergill of Bath, in a letter to the Regiſter, adviſes as a potent and active ſtimulus the patent muſtard moiſtened with ſpirits.

Gauls, and father of Saron or Naumes. Pliny, Salmaſius, Vigenere, &c. derive the name from δρυς, *oak;* on account of their inhabiting, or at leaſt frequenting, and teaching in foreſts; or perhaps becauſe, as Pliny ſays, they never ſacrificed but under the oak. But it is hard to imagine how the druids ſhould come to ſpeak Greek. Menage derives the word from the old Britiſh *drus*, "dæmon, magician." Borel, from the Saxon *dry*, "magician;" or rather from the old Britiſh *dru*, or *derw*, "oak," whence he takes δρυς to be derived; which is the moſt probable ſuppoſition. Gorop. Becanus, lib. i takes *druis* to be an old Celtic and German word, formed from *trowis* or *truwis*, "a doctor of the truth and the faith;" which etymology Voſſius acquieſces in.

1 General account of the druids.

The druids were the firſt and moſt diſtinguiſhed order among the Gauls and Britons; they were choſen out of the beſt families; and the honours of their birth, joined with thoſe of their function, procured them the higheſt veneration among the people. They were verſed in aſtrology, geometry, natural philoſophy, politics, and geography; they were the interpreters of religion, and the judges of all affairs indifferently. Whoever refuſed obedience to them was declared impious and accurſed. We know but little as to their peculiar doctrines; only that they believed the immortality of the ſoul; and, as is generally alſo ſuppoſed, the metempſychoſis; though a late author makes it appear highly probable they did not believe this laſt, at leaſt not in the ſenſe of the Pythagoreans.

The chief ſettlement of the druids in Britain was in the iſle of Angleſey, the ancient *Mona*, which they might chooſe for this purpoſe, as it is well ſtored with ſpacious groves of their favourite oak. They were divided into ſeveral claſſes or branches, viz. the *vacerri*, *bardi*, *eubages*, *ſemnothii* or *ſemnothei*, and *ſaronidæ*. The *vacerri* are held to have been the prieſts; the *bardi*, the poets; the *eubages*, the augurs; and the *ſaronidæ*, the civil judges and inſtructors of youth. As to the *ſemnothei*, who are ſaid to have been immediately devoted to the ſervice of religion, it is probable they were the ſame with the *vacerri*. Strabo, however, (lib. iv. p. 197.) and Picard after him in his Celtopædia, do not comprehend all theſe different orders under the denomination of druids, as ſpecies under their genus, or parts under the whole; but make them quite different conditions or orders. Strabo, in effect, only diſtinguiſhes three kinds; *bardi*, *vates*, and *druids*. The *bardi* were the poets; the *vates*, ουατεις (apparently the ſame with the *vacerri*), were the prieſts and naturaliſts; and the *druids*, beſide the ſtudy of nature, applied themſelves likewiſe to morality.

Diogenes Laertius aſſures us, in his Prologue, that the druids were the ſame among the ancient Britons with the ſophi or philoſophers among the Greeks; the magi among the Perſians; the gymnoſophiſts among the Indians; and the Chaldeans among the Aſſyrians.

Their garments were remarkably long; and, when employed in religious ceremonies, they always wore a white ſurplice. They generally carried a wand in their hands; and wore a kind of ornament enchaſed in gold about their necks, called the *druid's egg*. Their necks were likewiſe decorated with gold chains, and their hands and arms with bracelets: they wore their hair very ſhort, and their beards remarkably long.

The druids had one chief, or arch-druid, in every nation, who acted as high-prieſt, or *pontifex maximus*. He had abſolute authority over the reſt; and commanded, decreed, puniſhed, &c. at pleaſure. At his death he was ſucceeded by the moſt conſiderable among his ſurvivors; and, if there were ſeveral pretenders, the matter was ended by an election, or elſe put to the deciſion of arms.

The druids, we have obſerved, were in the higheſt eſteem. They preſided at ſacrifices, and other ceremonies; and had the direction of every thing relating to religion. The Britiſh and Gauliſh youth flocked to them in crowds, to be inſtructed by them. The children of the nobility, Mela tells us, they retired with into caves, or the moſt deſolate parts of foreſts, and kept them there ſometimes for twenty years under their diſcipline. Beſide the immortality and metempſychoſis, they were here inſtructed in the motion of the heavens, and the courſe of the ſtars; the magnitude of the heavens and the earth; the nature of things; the power and wiſdom of the gods, &c. They preſerved the memory and actions of great men in their verſes, which they never allowed to be wrote down, but made their pupils get them by heart. In their common courſe of learning, they are ſaid to have taught them twenty-four thouſand ſuch verſes. By this means their doctrines appeared more myſterious by being unknown to all but themſelves; and having no books to recur to, they were the more careful to fix them in their memory.

They worſhipped the Supreme Being under the name of *Eſus*, or *Heſus*, and the ſymbol of the oak; and had no other temple than a wood or a grove, where all their religious rites were performed. Nor was any perſon admitted to enter that ſacred receſs, unleſs he carried with him a chain, in token of his abſolute dependence on the Deity. Indeed, their whole religion originally conſiſted in acknowledging, that the Supreme Being, who made his abode in theſe ſacred groves, governed the univerſe; and that every creature ought to obey his laws, and pay him divine homage.

They conſidered the oak as the emblem, or rather the peculiar reſidence, of the Almighty; and accordingly chaplets of it were worn both by the druids and people in their religious ceremonies, the altars were ſtrewed with its leaves and encircled with its branches. The fruit of it, eſpecially the miſletoe, was thought to contain a divine virtue, and to be the peculiar gift of heaven. It was therefore ſought for on the ſixth day of the moon with the greateſt earneſtneſs and anxiety; and when found was hailed with ſuch raptures of joy, as almoſt exceeds imagination to conceive. As ſoon as the druids were informed of this fortunate diſcovery, they prepared every thing ready for the ſacrifice under the oak, to which they faſtened two white bulls by the horns; then the arch-druid, attended by a prodigious number of people, aſcended the tree, dreſſed in white; and with a conſecrated golden knife, or pruning hook, cropped the miſletoe, which he received in his ſagum or robe, amidſt the rapturous exclamations of the people. Having ſecured

cured this ſacred plant, he deſcended the tree; the bulls were ſacrificed; and the Deity invoked to bleſs his own gift, and render it efficacious in thoſe diſtempers in which it ſhould be adminiſtered.

The conſecrated groves, in which they performed their religious rites, were fenced round with ſtones, to prevent any perſon's entering between the trees, except through the paſſages left open for that purpoſe, and which were guarded by ſome inferior druids, to prevent any ſtranger from intruding into their myſteries. Theſe groves were of different forms; ſome quite circular, others oblong, and more or leſs capacious as the votaries in the diſtricts to which they belonged were more or leſs numerous. The area in the centre of the grove was encompaſſed with ſeveral rows of large oaks ſet very cloſe together. Within this large circle were ſeveral ſmaller ones ſurrounded with large ſtones; and near the centre of theſe ſmaller circles, were ſtones of a prodigious ſize and convenient height, on which the victims were ſlain and offered. Each of theſe being a kind of altar, was ſurrounded with another row of ſtones, the uſe of which cannot now be known, unleſs they were intended as cinctures to keep the people at a convenient diſtance from the officiating prieſt.

Suetonius, in his life of Claudius, aſſures us the druids ſacrificed men; and Mercury is ſaid to be the god to whom they offered theſe victims. Diod. Siculus, lib. vi. obſerves it was only upon extraordinary occaſions they made ſuch offerings; as, to conſult what meaſures to take, to learn what ſhould befal them, &c. by the fall of the victim, the tearing of his members, and the manner of his blood guſhing out. Auguſtus condemned the cuſtom, and Tiberius and Claudius puniſhed and aboliſhed it.

We learn from Cæſar, that the druids were the judges and arbiters of all differences and diſputes, both public and private: they took cognizance of murders, inheritances, boundaries, and limits; and decreed rewards and puniſhments. Such as diſobeyed their deciſions they excommunicated, which was their principal puniſhment; the criminal being hereby excluded from all public aſſemblies, and avoided by all the world; ſo that nobody durſt ſpeak to him for fear of being polluted. Strabo obſerves, they had ſometimes intereſt and authority enough to ſtop armies upon the point of engaging, and accommodate their differences.

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It hath been diſputed, whether the druids were themſelves the inventors of their opinions and ſyſtems of religion and philoſophy, or received them from others. Some have imagined, that the colony of Phocians which left Greece and built Marſeilles in Gaul about the 57th Olympiad, imported the firſt principles of learning and philoſophy, and communicated them to the Gauls and other nations in the weſt of Europe. It appears, indeed, that this famous colony contributed not a little to the improvement of that part of Gaul where it ſettled, and to the civilization of its inhabitants. "The Greek colony of Marſeilles (ſays Juſtin) civilized the Gauls, and taught them to live under laws; to build cities and incloſe them with walls; to raiſe corn; to cultivate the vine and olive; and, in a word, made ſo great a change both in the face of the country and the manners of its inhabitants, that Gaul ſeemed to be tranſlated into Greece, rather than a few Greeks tranſplanted into Gaul." But though we may allow that the druids of Gaul and Britain borrowed ſome hints and embelliſhments of their philoſophy from this Greek colony, and perhaps from other quarters, we have reaſon to believe that the ſubſtance of it was their own. Others have ſuggeſted, that the druids derived their philoſophy from Pythagoras, who publiſhed his doctrines at Crotona in Italy; where he lived in the higheſt reputation for his virtue, wiſdom, and learning, above 20 years. This conjecture is very much confirmed by this remarkable expreſſion of Ammianus Marcellinus, "That the druids were formed into fraternities, as the authority of Pythagoras decreed." It hath been alſo obſerved, that the philoſophy of the druids bore a much greater reſemblance to that of Pythagoras than to that of any of the other ſages of antiquity. But it ſeems probable, that Ammianus meant no more by the above expreſſion than to illuſtrate the nature of the druidical fraternities, by comparing them to thoſe of the Pythagoreans, which were well known to the Romans; and the reſemblance between the Pythagorean and druidical philoſophy may perhaps be beſt accounted for by ſuppoſing, that Pythagoras learned and adopted ſome of the opinions of the druids, as well as imparted to them ſome of his diſcoveries. It is well known, that this philoſopher, animated by the moſt ardent love of knowledge, travelled into many countries in purſuit of it, and got himſelf admitted into every ſociety that was famous for its learning. It is therefore highly probable in itſelf, as well as directly aſſerted by ſeveral authors, that Pythagoras heard the druids of Gaul, and was initiated into their philoſophy.

3
More particular account of the learning of the druids.

From the concurring teſtimonies of ſeveral authors, it appears that phyſiology, or natural philoſophy, was the favourite ſtudy of the druids of Gaul and Britain. Cicero tells us, that he was perſonally acquainted with one of the Gauliſh druids, Divitiacus the Æduan, a man of quality in his country, who profeſſed to have a thorough knowledge of the laws of nature, or that ſcience which the Greeks call *phyſics* or *phyſiology*. According to Diodorus Siculus, Strabo, Cæſar, Mela, Ammianus Marcellinus, and others, they entered into many diſquiſitions and diſputations in their ſchools, concerning the form and magnitude of the univerſe in general, and of this earth in particular, and even concerning the moſt ſublime and hidden ſecrets of nature. On theſe and the like ſubjects they formed a variety of ſyſtems and hypotheſes; which they delivered to their diſciples in verſe, that they might the more eaſily retain them in their memories, ſince they were not allowed to commit them to writing. Strabo hath preſerved one of the phyſiological opinions of the druids concerning the univerſe; *viz.* that it was never to be entirely deſtroyed or annihilated; but was to undergo a ſucceſſion of great changes and revolutions, which were to be produced ſometimes by the power and predominancy of water, and ſometimes by that of fire. This opinion, he intimates, was not peculiar to them, but was entertained alſo by the philoſophers of other nations; and Cicero ſpeaks of it as a truth univerſally acknowledged and undeniable. "It is impoſſible for us (ſays he) to attain a glory that is eternal, or even of very long duration, on account of thoſe deluges and conflagrations of the

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Phyſics, or natural philoſophy.

earth which muſt neceſſarily happen at certain periods." This opinion, which was entertained by the moſt ancient philoſophers of many different and very diſtant nations, was probably neither the reſult of rational inquiry in all theſe nations, nor communicated from one of them to others; but deſcended to them all from their common anceſtors of the family of Noah by tradition, but corrupted and miſunderſtood through length of time. The agreement of the druids with the philoſophers of ſo many other nations in this opinion about the alternate diſſolution and renovation of the world, gives us reaſon to believe, that they agreed with them alſo in their opinion of its origin from two diſtinct principles; the one intelligent and omnipotent, which was God; the other inanimate and inactive, which was matter. We are told by Cæſar, that they had many diſquiſitions about the power of God; and, no doubt, amongſt other particulars, about his creating power. But whether they believed with ſome that matter was eternal, or with others that it was created; and in what manner they endeavoured to account for the diſpoſition of it into the preſent form of the univerſe, we are entirely ignorant, though they certainly had their ſpeculations on theſe ſubjects. We are only informed, that they did not expreſs their ſentiments on theſe and the like heads in a plain and natural, but in a dark, figurative, and enigmatical manner. This might incline us to ſuſpect, that Pythageras had borrowed from them his doctrine about numbers, to whoſe myſtical energy he aſcribes the formation of all things; for nothing can be more dark and enigmatical than that doctrine. The druids diſputed likewiſe about the magnitude and form of the world in general, and of the earth in particular, of which things they pretended to have a perfect knowledge. We know not what their opinions were about the dimenſions of the univerſe or of the earth, but we have ſeveral reaſons to make us imagine that they believed both to be of a ſpherical form. This is viſibly the ſhape and form of the ſun, moon, and ſtars, the moſt conſpicuous parts of the univerſe; from whence it was natural and eaſy to infer, that this was the form of the world and of the earth. Accordingly this ſeems to have been the opinion of the philoſophers of all nations; and the circle was the favourite figure of the druids, as appears from the form both of their houſes and places of worſhip. Beſides theſe general ſpeculations about the origin, diſſolution, magnitude, and form of the world and of the earth, the druids engaged in particular inquiries into the natures and properties of the different kinds of ſubſtances. But all their diſcoveries in this moſt uſeful and extenſive branch of natural philoſophy, whatever they were, are entirely loſt.

5 Aſtronomy. Aſtronomy alſo appears to have been one of the chief ſtudies of the druids of Gaul and Britain. "The druids (ſays Cæſar) have many diſquiſitions concerning the heavenly bodies and their motions, in which they inſtruct their diſciples." Mela, ſpeaking of the ſame philoſophers, obſerves, "That they profeſs to have great knowledge of the motions of the heavens and of the ſtars." Some knowledge of this ſcience indeed was not only neceſſary for meaſuring time in general, marking the duration of the different ſeaſons, regulating the operations of the huſbandman, directing the courſe of the mariner, and for many other purpoſes in civil life; but it was eſpecially neceſſary for fixing the times and regular returns of their religious ſolemnities, of which the druids had the ſole direction. Some of theſe ſolemnities were monthly, and others annual. It was therefore neceſſary for them to know, with ſome tolerable degree of exactneſs, the number of days in which the ſun and moon performed their revolutions, that theſe ſolemnities might be obſerved at their proper ſeaſons. This was the more neceſſary, as ſome of theſe ſolemnities were attended by perſons from different and very diſtant countries, who were all to meet at one place on one day; who muſt have had ſome rule to diſcover the annual return of that day.

6 Their th d comp time. The moſt perceptible diviſion of time by the two great luminaries is into day and night; the former occaſioned by the preſence of the ſun above the horizon, the latter by his abſence, which is in ſome meaſure ſupplied by the moon and ſtars. The druids computed their time by nights, and not by days; a cuſtom which they had received from their moſt remote anceſtors by tradition, and in which they were confirmed by their meaſuring their time very much by the moon, the miſtreſs and queen of night. As the changes in the aſpect of that luminary are moſt conſpicuous, they engaged the attention of the moſt ancient aſtronomers of all countries, and particularly of the druids, who regulated all their great ſolemnities, both ſacred and civil, by the age and aſpect of the moon. "When no unexpected accident prevents it, they aſſemble upon ſtated days, either at the time of the new or full moon; for they believe theſe to be the moſt auſpicious times for tranſacting all affairs of importance." Their moſt auguſt ceremony of cutting the miſletoe from the oak by the archdruid, was always performed on the ſixth day of the moon. Nay, they even regulated their military operations very much by this luminary, and avoided, as much as poſſible, to engage in battle while the moon was on the wane. As the attention of the druids was ſo much fixed on this planet, it could not be very long before they diſcovered that ſhe paſſed through all her various aſpects in about thirty days; and by degrees, and more accurate obſervations, they would find, that the real time of her performing an entire revolution was very nearly 29½ days. This furniſhed them with the diviſion of their time into months, or revolutions of the moon; of which we know with certainty they were poſſeſſed. But this period, though of great uſe, was evidently too ſhort for many purpoſes, and particularly for meaſuring the ſeaſons; which they could not fail to perceive depended on the influences of the ſun. By continued obſervation they diſcovered, that about 12 revolutions of the moon included all the variety of ſeaſons, which begun again, and revolved every 12 months. This ſuggeſted to them that larger diviſion of time called a year, conſiſting of 12 lunations, or 354 days, which was the moſt ancient meaſure of the year in almoſt all nations. That this was for ſome time at leaſt the form of the druidical year, is both probable in itſelf, and from the following expreſſion of Pliny: "That they begun both their months and years, not from the change, but from the ſixth day of the moon." This is even a demonſtration that their years conſiſted of a certain number of lunar revolutions, as they always commenced on the ſame day of

of the moon. But as this year of 12 lunar months falls 11 days and nearly one-fourth of a day ſhort of a real revolution of the ſun, this error would ſoon be perceived, and call for reformation; though we are not informed of the particular manner in which it was rectified. Various arguments might be collected to make it very probable that the Britons were acquainted with a year exact enough for every purpoſe of life, when they were firſt invaded by the Romans; but it will be ſufficient to mention one, which is taken from the time and circumſtances of that invaſion. The learned Dr Halley hath demonſtrated that Cæſar arrived in Britain, in his firſt year's expedition, on the 26th day of Auguſt: and Cæſar himſelf informs us, that at his arrival the harveſt was finiſhed, except in one field, which by ſome means or other was more backward than the reſt of the country. This is a proof that the Britiſh huſbandmen knew and uſed the moſt proper ſeaſons for ploughing, ſowing, and reaping. The druids, as we are told by Pliny, had alſo a cycle or period of 30 years, which they called an age, and which commenced likewiſe on the ſixth day of the moon; but that author hath not acquainted us on what principles this cycle was formed, nor to what purpoſes it was applied. We can hardly ſuppoſe that this was the cycle of the ſun, which conſiſts of 28 years, and regulates the dominical letters. It is more probable, that while the druids made uſe of the year of 12 lunar months, and had not invented a method of adjuſting it to the real revolution of the ſun, they obſerved that the beginning of this year had paſſed through all the ſeaſons, and returned to the point from whence it ſet out, in a courſe of about 33 years; which they might therefore call an age. Others may perhaps be of opinion, that this 30 years cycle of the druids is the ſame with the great year of the Pythagoreans, or a revolution of Saturn. Some have imagined that the druids were alſo acquainted with the cycle of 19 years, which is commonly called the cycle of the moon. But the evidence of this depends entirely on the truth of that ſuppoſition, that the Hyperborean iſland, which is deſcribed by Diodorus Siculus, was Britain, or ſome of the Britiſh iſles. Among many other ſurpriſing things, that author ſays, concerning this Hyperborean iſland, "That its inhabitants believed that Apollo deſcended into their iſland at the end of every 19 years; in which period of time the ſun and moon, having performed their various revolutions, return to the ſame point, and begin to repeat the ſame revolutions. This is called by the Greeks the great year, or the cycle of Meton."

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We are told both by Cæſar and Mela, that the druids ſtudied the ſtars as well as the ſun and moon; and that they profeſſed to know, and taught their diſciples, many things concerning the motions of theſe heavenly bodies. From theſe teſtimonies we may conclude that the druids were acquainted with the planets, diſtinguiſhed them from the fixed ſtars, and carefully obſerved their motions and revolutions. If this diſcovery was the reſult of their own obſervations, it would be gradual, and it would be a long time before they found out all the planets. They might perhaps have received ſome aſſiſtance and information from Pythagoras, or from ſome other quarter. But whether this diſcovery of the planets was their own, or communicated to them by others, it is highly probable that they were acquainted with the preciſe number of theſe wandering ſtars. Dio Caſſius ſays, that the cuſtom of giving the name of one of the planets to each of the ſeven days of the week was an invention of the Egyptians, and from them was gradually communicated to all the other nations of the world; and that in his time this cuſtom was ſo firmly eſtabliſhed, not only among the Romans, but among all the reſt of mankind, that in every country it appeared to be a native inſtitution. The knowledge of the planets, and perhaps the cuſtom of giving their names to the days of the week, was brought out of Egypt into Italy by Pythagoras, more than 500 years before the beginning of the Chriſtian era; and from thence it could not be very long before it reached Gaul and Britain. But though we have little or no reaſon to doubt that the druids knew the number and obſerved the motion of the planets, yet it may be queſtioned whether they had diſcovered the times in which they performed their ſeveral revolutions. Some of theſe ſtars, as Jupiter and Saturn, take ſo great a number of years in revolving, that it required a very extraordinary degree of patience and attention to diſcover the preciſe periods of their revolutions. If we could be certain that the iſland in which the ancients imagined Saturn lay aſleep, was one of the Britiſh iſles, as Plutarch intimates it was, we might be inclined to think that the Britiſh druids were not ignorant of the length of the period in which the planet Saturn performs a revolution. For that ſame author, in another treatiſe, tells us, "That the inhabitants of that iſland kept every thirtieth year a ſolemn feſtival in honour of Saturn, when his ſtar entered into the ſign of Taurus."

If we could depend upon the above teſtimony of Plutarch, we ſhould have one poſitive proof that the druids of the Britiſh iſles were acquainted with the conſtellations, and even with the ſigns of the zodiac; and that they meaſured the revolutions of the ſun and planets, by obſerving the length of time between their departure from and return to one of theſe ſigns. But we have no direct evidence of this remaining in hiſtory.

The druids of Gaul and Britain, as well as the ancient philoſophers of other countries, had a general plan or ſyſtem of the univerſe, and of the diſpoſition and arrangement of its various parts, in which they inſtructed their diſciples. This is both probable in itſelf, and is plainly intimated by ſeveral authors of the greateſt authority. But we cannot be certain whether this druidical ſyſtem of the world was of their own invention, or was borrowed from others. If it was borrowed, it was moſt probably from the Pythagoreans, to whom they were the neareſt neighbours, and with whom they had the greateſt intercourſe.

It hath been imagined, that the druids had inſtruments of ſome kind or other, which anſwered the ſame purpoſes with our teleſcopes, in making obſervations on the heavenly bodies. The only foundation of this very improbable conjecture is an expreſſion of Diodorus Siculus, in his deſcription of the famous Hyperborean iſland. They ſay further, that the moon is ſeen from that ſland, as if ſhe was but at a little diſtance from the earth, and having hills or mountains like ours on her ſurface. But no ſuch inference can be reaſonably drawn from this expreſſion, which in reality merits little more regard than what Strabo reports was ſaid of ſome of the inhabitants of Spain: "That they heard the hiſſing noiſe of the ſun every evening when he fell into the weſtern ocean."

The application of the druids to the ſtudy of philoſophy and aſtronomy amounts almoſt to a demonſtration that they applied alſo to the ſtudy of arithmetic and geometry. For ſome knowledge of both theſe ſciences is indiſpenſably neceſſary to the phyſiologiſt and aſtronomer, as well as of great and daily uſe in the common affairs of life.

8
Arithmetic

If we were certain that Abaris, the famous Hyperborean philoſopher, the friend and ſcholar of Pythagoras, was really a Britiſh druid, as ſome have imagined, we ſhould be able to produce direct hiſtorical evidence of their arithmetic knowledge. For Iamblicus, in the life of Pythagoras, ſays, "that he taught Abaris to find out all truth by the ſcience of arithmetic." It may be thought improbable that the druids had made any conſiderable progreſs in arithmetic, as this may ſeem to be impoſſible by the mere ſtrength of memory without the aſſiſtance of figures and of written rules. But it is very difficult to aſcertain what may be done by memory alone, when it hath been long exerciſed in this way. We have had an example in our own age, of a perſon * who could perform ſome of the moſt tedious and difficult operations in arithmetic by the mere ſtrength of his memory. The want of written rules could be no great diſadvantage to the druids, as the precepts of this, as well as of the other ſciences, were couched in verſe, which would be eaſily got by heart and long remembered. Though the druids were unacquainted with the Arabic characters which are now in uſe, we have no reaſon to ſuppoſe that they were deſtitute of marks or characters of ſome other kind, which, in ſome meaſure, anſwered the ſame purpoſes, both in making and recording their calculations. In particular, we have reaſon to think, that they made uſe of the letters of the Greek alphabet for both theſe purpoſes. This ſeems to be plainly intimated by Cæſar in the following expreſſion concerning the druids of Gaul: "In almoſt all other public tranſactions, and private accounts or computations, they make uſe of the Greek letters." This is further confirmed by what the ſame author ſays of the Helvetii; a people of the ſame origin, language, and manners, with the Gauls and Britons. "Tables were found in the camp of the Helvetii written in Greek letters, containing an account of all the men capable of bearing arms, who had left their native country, and alſo ſeparate accounts of the boys, old men, and women." There is hiſtorical evidence of the druids being alſo well acquainted with geometry. "When any diſputes ariſe (ſays Cæſar) about their inheritances, or any controverſies about the limits of their fields, they are entirely referred to the deciſion of their druids." But beſides the knowledge of menſuration which this implies, both Cæſar and Mela plainly intimate that the druids were converſant in the moſt ſublime ſpeculations of geometry; "in meaſuring the magnitude of the earth, and even of the world."

9
Skill in mechanics.

There are ſtill many monuments remaining in Britain and the adjacent iſles, which cannot ſo reaſonably be aſcribed to any as to the ancient Britons, and which give us cauſe to think, that they had made great progreſs in this uſeful part of learning, and could apply the mechanical powers ſo as to produce very aſtoniſhing effects. As theſe monuments appear to have been deſigned for religious purpoſes, we may be certain that they were erected under the direction of the druids. How many obeliſks or pillars, of one rough unpoliſhed ſtone each, are ſtill to be ſeen in Britain and its iſles? Some of theſe pillars are both very thick and lofty, erected on the ſummits of barrows and of mountains; and ſome of them (as at Stonehenge) have ponderous blocks of ſtone raiſed aloft, and reſting on the tops of the upright pillars. We can hardly ſuppoſe that it was poſſible to cut theſe prodigious maſſes of ſtone (ſome of them above forty tons in weight) without wedges, or to raiſe them out of the quarry without levers. But it certainly required ſtill greater knowledge of the mechanical powers, and of the method of applying them, to tranſport thoſe huge ſtones from the quarry to the places of their deſtination; to erect the perpendicular pillars, and to elevate the impoſts to the tops of theſe pillars. If that prodigious ſtone in the pariſh of Conſtantine, Cornwal, was really removed by art from its original place, and fixed where it now ſtands (as one of our moſt learned and diligent antiquaries thinks it was †), it is a demonſtration, that the druids could perform the moſt aſtoniſhing feats by their ſkill in mechanics. That the Britiſh druids were acquainted with the principles and uſe of the balance, we have good reaſon to believe, not only from the great antiquity of that diſcovery in other parts of the world, but alſo from ſome druidical monuments which are ſtill remaining in this iſland. Theſe monuments are called *Lagan ſtones*, or rocking ſtones; and each of them conſiſts of one prodigious block of ſtone, reſting upon an upright ſtone or rock, and ſo equally balanced, that a very ſmall force, ſometimes even a child, can move it up and down, though hardly any force is ſufficient to remove it from its ſtation. Some of theſe ſtones may have fallen into this poſition by accident, but others of them evidently appear to have been placed in it by art. That the ancient Britons underſtood the conſtitution and uſe of wheels, the great number of their war-chariots and other wheel-carriages is a ſufficient proof; and that they knew how to combine them together and with the other mechanical powers, ſo as to form machines capable of raiſing and tranſporting very heavy weights, we have good reaſon to believe. In a word, if the Britiſh druids were wholly ignorant of the principles and uſe of any of the mechanical powers, it was moſt probably of the ſcrew, though even of this we cannot be certain.

10
Medici

In Germany and in the northern nations of Europe the healing art was chiefly committed to the old women of every ſtate; but in Gaul and Britain it was intruſted to the druids, who were the phyſicians as well as the prieſts of theſe countries. Pliny ſays expreſsly, "That Tiberius Cæſar deſtroyed the druids of the Gauls, who were the poets and phyſicians of that nation;" and he might have added of the Britons. The people of Gaul and Britain were probably induced to devolve the care of their health on the druids, and to apply to theſe prieſts for the cure of their diſeaſes, not only by the high eſteem they had of their wiſdom and learning, but alſo by the opinion which they entertained,

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* See Buxton (*Jedediah*).

† *Dr B*
*las's A*
*Cornwa*
p. 174,

tertained, that a very intimate connection ſubſiſted between the arts of healing and the rites of religion, and that the former were moſt effectual when they were accompanied by the latter. It appears indeed to have been the prevailing opinion of all the nations of antiquity, that all internal diſeaſes proceeded immediately from the anger of the gods; and that the only way of obtaining relief from theſe diſeaſes was by applying to their prieſts to appeaſe their anger by religious rites and ſacrifices. This was evidently the opinion and practice of the Gauls and Britons, who in ſome dangerous caſes ſacrificed one man as the moſt effectual means of curing another. "They are much addicted (ſays Cæſar) to ſuperſtition; and for this cauſe, thoſe who are afflicted with a dangerous diſeaſe ſacrifice a man, or promiſe that they will ſacrifice one, for their recovery. For this purpoſe they make uſe of the miniſtry of the druids; becauſe they have declared, that the anger of the immortal gods cannot be appeaſed, ſo as to ſpare the life of one man but by the life of another." This way of thinking gave riſe alſo to that great number of magical rites and incantations with which the medical practices of the druids, and indeed of all the phyſicians of antiquity, were attended. "No body doubts (ſays Pliny) that magic derived its origin from medicine, and that by its flattering but deluſive promiſes, it came to be eſteemed the moſt ſublime and ſacred part of the art of healing."

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That the druids made great uſe of herbs for medicinal purpoſes, we have ſufficient evidence. They not only had a moſt ſuperſtitious veneration for the miſletoe of the oak, on a religious account, but they alſo entertained a very high opinion of its medical virtues, and eſteemed it a kind of panacea or remedy for all diſeaſes. "They call it (ſays Pliny) by a name which in their language ſignifies *Alheal*, becauſe they have an opinion that it cureth all diſeaſes." They believed it to be in particular a ſpecific againſt barrenneſs, and a ſovereign antidote againſt the fatal effects of poiſons of all kinds. It was eſteemed alſo an excellent emollient and diſcutient for ſoftening and diſcuſſing hard tumors; good for drying up ſcrophulous ſores; for curing ulcers and wounds; and (provided it was not ſuffered to touch the earth after it was cut) it was thought to be a very efficacious medicine in the epilepſy or falling-ſickneſs. It hath been thought uſeful in this laſt calamitous diſeaſe by ſome modern phyſicians. The pompous ceremonies with which the miſletoe was gathered by the druids have been already deſcribed. The ſelago, a kind of hedge hyſſop reſembling ſavin, was another plant much admired by the druids of Gaul and Britain for its ſuppoſed medicinal virtues, particularly in all diſeaſes of the eyes. But its efficacy, according to them, depended very much upon its being gathered exactly in the following manner: The perſon who gathered it was to be clothed in a white robe, to have his feet bare, and waſhed in pure water; to offer a ſacrifice of bread and wine before he proceeded to cut it; which he was to do with his right hand covered with the ſkirt of his garment, and with a hook of ſome more precious metal than iron. When it was cut, it was to be received into, and kept in a new and very clean cloth. When it was gathered exactly according to this whimſical ritual, they affirmed that it was not only an excellent medicine, but alſo a powerful charm and preſervative from misfortunes and unhappy accidents of all kinds. They entertained a high opinion alſo of the herb Samolus or marſhwort, for its ſanative qualities; and gave many directions for the gathering it, no leſs fanciful than thoſe above mentioned. The perſon who was to perform that office was to do it faſting, and with his left hand; he was on no account to look behind him, nor to turn his face from the herbs he was gathering. It would be tedious to relate the extravagant notions they entertained of the many virtues of the vervain, and to recount the ridiculous mummeries which they practiſed in gathering and preparing it, both for the purpoſes of divination and phyſic. Theſe things may be ſeen in Plin. Hiſt. Nat. l. 25. c. 9. from whence we have received all theſe anecdotes of the botany of the druids. It is eaſy to ſee that his information was very imperfect; and that, like many of the other Greek and Roman writers, he deſignedly repreſents the philoſophers of Gaul and Britain in an unfavourable light. The herb which was called *Britannica* by the ancients, which ſome think was the great water-dock, and others the cochlearea or ſcurvy-graſs, was probably much uſed in this iſland for medical purpoſes; as it derived its name from hence, and was from hence exported to Rome and other parts. Though theſe few imperfect hints are all that we can now collect of the botany of the Britiſh druids, yet we have ſome reaſon to think that they were not contemptible botaniſts. Their circumſtances were peculiarly favourable for the acquiſition of this kind of knowledge. For as they ſpent moſt of their time in the receſſes of mountains, groves, and woods, the ſpontaneous vegetable productions of the earth conſtantly preſented themſelves to their view, and courted their attention.

The opinions which, it is ſaid, the druids of Gaul and Britain entertained of their anguinum or ſerpents egg, both as a charm and as a medicine, are romantic and extravagant in a very high degree. This extraordinary egg was formed, as they pretended, by a great number of ſerpents interwoven and twined together; and when it was formed, it was raiſed up in the air by the hiſſing of theſe ſerpents, and was to be catched in a clean white cloth, before it fell to the ground. The perſon who catched it was obliged to mount a ſwift horſe, and to ride away at full ſpeed to eſcape from the ſerpents, who purſued him with great rage, until they were ſtopped by ſome river. The way of making trial of the genuineneſs of this egg was no leſs extraordinary. It was to be enchaſed in gold, and thrown into a river, and if it was genuine it would ſwim againſt the ſtream. "I have ſeen (ſays Pliny) that egg; it is about the bigneſs of a moderate apple, its ſhell is a cartilaginous incruſtation, full of little cavities, ſuch as are on the legs of the polypus; it is the inſignia, or badge of diſtinction of the druids." The virtues which they aſcribed to this egg were many and wonderful. It was particularly efficacious to render thoſe who carried it about with them ſuperior to their adverſaries in all diſputes, and to procure them the favour and friendſhip of great men. Some have thought that this whole affair of the ſerpents egg was a mere fraud, contrived by the druids, to excite the admiration and pick the pockets of credulous people, who purchaſed theſe wonder-working eggs from them

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at a high price. Others have imagined that this ſtory of the anguinum (of which there is an ancient monument in the cathedral at Paris) was an emblematical repreſentation of the doctrine of the druids concerning the creation of the world. The ſerpents, ſay they, repreſent the Divine Wiſdom forming the univerſe, and the egg is the emblem of the world formed by that Wiſdom. It may be added, that the virtue aſcribed to the anguinum, of giving thoſe who poſſeſſed it a ſuperiority over others, and endearing them to great men, may perhaps be intended to repreſent the natural effects of learning and philoſophy. But in ſo doubtful a matter every one is at full liberty to form what judgment he thinks proper.

12
Rhetoric.

As the influence and authority of the druids in their country depended very much upon the reputation of their ſuperior wiſdom and learning, they wiſely applied to the ſtudy of thoſe ſciences which moſt directly contributed to the ſupport and advancement of that reputation. In this number, beſides thoſe already mentioned, we may juſtly reckon rhetoric, which was diligently ſtudied and taught by the druids of Gaul and Britain; who to the charms of their eloquence were indebted for much of the admiration and authority which they enjoyed. They had indeed many calls and opportunities to diſplay their eloquence, and to diſcover its great power and efficacy; as, when they were teaching their pupils in their ſchools, when they diſcourſed in public to the people on religious and moral ſubjects, when they pleaded cauſes in the courts of juſtice, and when they harangued in the great councils of the nation, and at the heads of armies ready to engage in battle; ſometimes with a view to inflame their courage, and at other times with a deſign to allay their fury, and diſpoſe them to make peace. Though this laſt was certainly a very difficult taſk among fierce and warlike nations, yet ſuch was the authority and eloquence of the druids that they frequently ſucceeded in it. "They pay a great regard (ſays Diodorus Siculus) to their exhortations, not only in the affairs of peace, but even of war, and theſe are reſpected both by their friends and enemies. They ſometimes ſtep in between two hoſtile armies, who are ſtanding with their ſwords drawn and their ſpears extended, ready to engage; and by their eloquence, as by an irreſiſtible enchantment, they prevent the effuſion of blood, and prevail upon them to ſheath their ſwords. So great are the charms of eloquence and the power of wiſdom, even among the moſt fierce barbarians." The Britiſh kings and chieftains, who were educated by the druids, were famous for their eloquence. This is evident from the many noble ſpeeches which are aſcribed to them by the Greek and Roman writers. For though theſe ſpeeches may not be genuine, yet they are a proof that it was a well-known fact that theſe princes were accuſtomed to make harangues on theſe and the like occaſions. This we are expreſsly told by Tacitus. "The Britiſh chieftains, before a battle, fly from rank to rank, and addreſs their men with animating ſpeeches, tending to inflame their courage, increaſe their hopes, and diſpel their fears." Theſe harangues were called, in the ancient language of Britain, *Broſnichiy Kah*, which is literally tranſlated by Tacitus *Incitamenta Belli*, "incentives to war." The genuine poſterity of the ancient Britons long retained their taſte for eloquence, and their high eſteem for thoſe who excelled in that art. "Orators (ſays Mr Martin) were in high eſteem, both in theſe iſlands (the Æbude) and the continent, until within theſe forty years. They ſat always among the nobles or chiefs of families in the ſtreah or circle. Their houſes and little villages were ſanctuaries, as well as churches, and they took place before doctors of phyſic. The orators, after the druids were extinct, were brought in to preſerve the genealogy of families, and to repeat the ſame at every ſucceſſion of a chief; and upon the occaſion of marriages and births, they made epithalamiums and panegyrics, which the poet or bard pronounced. The orators, by the force of their eloquence, had a powerful aſcendant over the greateſt men in their time. For if any orator did but aſk the habit, arms, horſe, or any other thing belonging to the greateſt man in theſe iſlands, it was readily granted him; ſometimes out of reſpect, and ſometimes for fear of being exclaimed againſt by a ſatyr, which in thoſe days was reckoned a great diſhonour."

Magi
divina

If the Britiſh druids, conſidering the times in which they lived, had made no contemptible proficiency in ſeveral parts of real and uſeful learning; it cannot be denied that they were alſo great pretenders to ſuperior knowledge in certain vain fallacious ſciences, by which they excited the admiration, and took advantage of the ignorance and credulity of mankind. Theſe were the ſciences (if they may be ſo called) of magic and divination; by which they pretended to work a kind of miracles, and exhibit aſtoniſhing appearances in nature; to penetrate into the counſels of heaven; to foretel future events, and to diſcover the ſucceſs or miſcarriage of public or private undertakings. Their own countrymen not only believed that the druids of Gaul and Britain were poſſeſſed of theſe powers, but they were celebrated on this account by the philoſophers of Greece and Rome. "In Britain (ſays Pliny) the magic arts are cultivated with ſuch aſtoniſhing ſucceſs, and ſo many ceremonies at this day, that the Britons ſeem to be capable of inſtructing even the Perſians themſelves in theſe arts. They pretend to diſcover the deſigns and purpoſes of the gods. The Eubates or Vates in particular inveſtigate and diſplay the moſt ſublime ſecrets of nature; and, by auſpices and ſacrifices, they foretel future events." They were ſo famous for the ſuppoſed veracity of their predictions, that they were not only conſulted on all important occaſions by their own princes and great men, but even ſometimes by the Roman emperors. Nor is it very difficult to account for all this. The druids finding that the reputation of their magical and prophetical powers contributed not a little to the advancement of their wealth and influence, they endeavoured, no doubt, to ſtrengthen and eſtabliſh it by all their art and cunning. Their knowledge of natural philoſophy and mechanics enabled them to execute ſuch works, and to exhibit ſuch appearances, or to make the world believe that they did exhibit them, as were ſufficient to gain them the character of great magicians. The truth is, that nothing is more eaſy than to acquire this character in a dark age, and among an unenlightened people. When the minds of men are haunted with dreams of charms and enchantments, they are apt to fancy that the moſt common occurrences

currences in nature are the effects of magical arts. The following ſtrange ſtory, which we meet with in Plutarch's Treatiſe of the Ceſſation of Oracles, was probably occaſioned by ſomething of this kind. "There are many iſlands which lie ſcattered about the iſle of Britain, after the manner of our Sporades. They are generally unpeopled, and ſome of them are called the *Iſlands of the Heroes*. One Demetrius was ſent by the emperor (perhaps Claudius) to diſcover thoſe parts. He arrived at one of theſe iſlands (ſuppoſed by ſome to be Angleſey, but more probably one of Æbudæ) next adjoining to the iſle of Britain before mentioned, which was inhabited by a few Britons, who were eſteemed ſacred and inviolable by their countrymen. Immediately after his arrival the air grew black and troubled, and ſtrange apparitions were ſeen; the winds roſe to a tempeſt, and fiery ſpouts and whirlwinds appeared dancing towards the earth." This was probably no more than a ſtorm of wind, accompanied with rain and lightning; a thing neither unnatural nor uncommon: but Demetrius and his companions having heard that the Britiſh druid , by whom this iſle was chiefly inhabited, were great magicians, they imagined that it was raiſed by them; and fancied that they ſaw many ſtrange unnatural ſights. The druids did not think proper to undeceive them: for when they enquired at them about the cauſe of this ſtorm, they told them it was occaſioned by the death of one of thoſe inviſible beings or genii who frequented their iſle. A wonderful and artful tale, very well calculated to encreaſe the ſuperſtitious terrors of Demetrius and his crew; and to determine them to abandon this enchanted iſle, with a reſolution never to return. Stonehenge, and ſeveral other works of the druids, were believed to have been executed by the arts of magic and enchantment, for many ages after the deſtruction of their whole order: nor is it improbable that they perſuaded the vulgar in their own times to entertain the ſame opinion of theſe works, by concealing from them the real arts by which they were performed. The natural and acquired ſagacity of the druids, their long experience, and great concern in the conduct of affairs, enabled them to form very probable conjectures about the events of enterpriſes. Theſe conjectures they pronounced as oracles, when they were conſulted; and they pretended to derive them from the inſpection of the entrails of victims, the obſervation of the flight and feeding of certain birds, and many other mummeries. By theſe, and the like arts, they obtained and preſerved the reputation of prophetic foreſight among an ignorant and credulous people. But theſe pretenſions of the druids to magic and divination, which contributed ſo much to the advancement of their fame and fortune in their own times, have brought very heavy reproaches upon their memory, and have made ſome learned moderns declare that they ought to be expunged out of the catalogue of philoſophers, and eſteemed no better than mere cheats and jugglers. This cenſure is evidently too ſevere, and might have been pronounced with equal juſtice upon all the ancient philoſophers of Egypt, Aſſyria, Perſia, Greece, and Rome; who were great pretenders to magic and divination, as well as our druids. "I know of no nation in the world (ſays Cicero) either ſo polite and learned, or ſo ſavage and barbarous, as not to believe that future events are preſignified to us, and may by ſome men be diſcovered and foretold." The only concluſion therefore that can be fairly drawn, from the ſucceſsful pretenſions of the Britiſh druids to the arts of magic and divination, is this—That they had more knowledge than their countrymen and cotemporaries; but had not ſo much virtue to reſiſt the temptation of impoſing upon their ignorance, to their own advantage.

DRUM, is a martial muſical inſtrument in form of a cylinder, hollow within, and covered at the two ends with vellum, which is ſtretched or ſlackened at pleaſure by the means of ſmall cords or ſliding knots. It is beat upon with ſticks. Drums are ſometimes made of braſs, but moſt commonly they are of wood.—The drum is by Le Clerc ſaid to have been an oriental invention, and to have been brought by the Arabians, or perhaps rather the Moors, into Spain.

*Kettle Drums*, are two ſorts of large baſons of copper or braſs, rounded in the bottom, and covered with vellum or goat ſkin, which is kept faſt by a circle of iron round the body of the drum, with a number of ſcrews to ſcrew up and down. They are much uſed among the horſe; as alſo in operas, oratorios, concerts, &c.

DRUM, or *Drummer*, he that beats the drum; of whom each company of foot has one, and ſometimes two. Every regiment has a drum-major, who has the command over the other drums. They are diſtinguiſhed from the ſoldiers by cloaths of a different faſhion: their poſt, when a battalion is drawn up, is on the flanks, and on a march it is betwixt the diviſions.

*Drum of the Ear*, the ſame with the *tympanum*. See ANATOMY, nº 141.

DRUMMOND (William), a polite writer, born in Scotland in 1585, was the ſon of Sir John Drummond, who for ten or twelve years was uſher and afterwards knight of the black rod to James VI. His family became firſt diſtinguiſhed by the marriage of Robert III. whoſe queen was ſiſter to William Drummond of Carnock their anceſtor; as appears by the patents of that king and James I. the one calling him "our brother," the other "our uncle."

Drummond was educated at Edinburgh, where he took the degree of A. M. In 1606 he was ſent by his father to ſtudy civil law at Bourges in France: but having no taſte for the profeſſion of a lawyer, he returned to Scotland, and retired to his agreeable ſeat at Hawthornden; where he applied himſelf with great aſſiduity to claſſical learning and poetry, and obliged the world with ſeveral fine productions. Here he wrote his Cypreſs Grove, a piece of excellent proſe, after a dangerous fit of ſickneſs; and about the ſame time, his Flowers of Sion, in verſe. But an accident befel him, which obliged him to quit his retirement; and that was the death of an amiable lady to whom he was juſt going to be married. This affected him ſo deeply, that he went to Paris and Rome, between which two places he reſided eight years. He travelled alſo thro' Germany, France, and Italy: where he viſited univerſities; converſed with learned men; and made a choice collection of the ancient Greek, and of the modern Spaniſh, French, and Italian books. He then returned to his native country; and ſome time thereafter married

married Margaret Logan, a grand-daughter of Sir Robert Logan. Upon the appearance of a civil war, he retired again; and in this retirement is ſuppoſed to have written his hiſtory of the Five James's, ſucceſſively kings of Scotland, which was not publiſhed till after his death. Having been grafted as it were on the royal family of Scotland, and upheld by them, he was ſteadily attached to Charles I.; but does not appear ever to have armed for him. As he had always been a laborious ſtudent, and had applied himſelf equally to hiſtory and politics as to claſſical learning, his ſervices were better rendered by occaſional publications, in which he ſeveral times diſtinguiſhed himſelf. In a piece called *Irene*, he harangues the king, nobility, and clergy, about their mutual miſtakes, fears, and jealouſies; and lays before them the conſequences of a civil war, from indiſputable arguments and the hiſtories of paſt times. The great Marquis of Montroſe wrote a letter to him, deſiring him to print this Irene, as the beſt means to quiet the minds of a diſtracted people: he likewiſe ſent him a protection dated Auguſt 1645, immediately after the battle of Kilſyth, with a letter, in which he commends Mr Drummond's learning and loyalty. Mr Drummond wrote other things alſo with the ſame view of promoting peace and union, of calming the diſturbed minds of the people, of reaſoning the better ſort into moderation, and checking the growing evils which would be the conſequence of their obſtinacy. But his efforts were fruitleſs; and his attachment to the king and his cauſe were ſo ſtrong, that when he heard of the ſentence being executed on him, he was overwhelmed with grief, and lifted his head no more. He died in the year 1649, leaving behind him ſeveral children: the eldeſt of whom, William, was knighted by Charles II. He had a great intimacy and correſpondence with the two famous Engliſh poets, Michael Drayton and Ben Johnſon; the latter of whom, at the age of 45, travelled from London on foot, to viſit him at Hawthornden. An edition of his works, with his life prefixed, was printed in folio at Edinburgh, 1711.

Among all the writers, at the beginning of the laſt century, who flouriſhed after the death of Shakeſpeare, an ingenious critic † obſerves, there is not one whom a general reader of the Engliſh poetry of that age will regard with ſo much and ſo deſerved attention as William Drummond. In a ſurvey of his poetry, two conſiderations muſt be had, *viz.* the nation of which he was, and the time when he wrote. Yet will theſe be found not offered to extenuate faults, but to increaſe admiration. His thoughts are often, nay generally, bold and highly poetical: he follows nature, and his verſes are delicately harmonious. As his poems are not eaſily met with, and have perhaps by many readers never been heard of, a few extracts may be excuſed.

On the death of Henry prince of Wales in 1612, Drummond wrote an elegy intitled Tears on the Death of Moeliades; a name which that prince had uſed in all his challenges of martial ſport, as the anagram of *Miles a Deo*. In this poem are lines, according to Denham's terms, as ſtrong, as deep, as gentle, and as full, as any of his or Waller's. The poet laments the fate of the prince, that he died not in ſome glorious cauſe of war: "againſt the Turk (he ſays) thou hadſt ended thy life and the Chriſtian war together;"

> Or, as brave Bourbon, thou hadſt made old Rome,
> Queen of the world, thy triumph and thy tombe.

Of the lamentation of the river Forth:

> And as ſhe ruſh'd her Cyclades among,
> She ſeem'd to plain that Heaven had done her wrong.

Further:

> Tagus did court his love with golden ſtreams,
> Rhine with her towns, fair Seine with all ſhe claims:
> But ah, poor lovers! death did them betray;
> And, unſuſpected, made their hopes his prey.

And concludes:

> The virgins to thy tomb will garlands bear
> Of flow'rs, and with each flow'r let fall a tear.
> Moeliades ſweet courtly nymphs deplore,
> From Thule to Hydaſpes' pearly ſhore.

Perhaps there are no lines of Pope of which the eaſy flow may be more juſtly admired than of thoſe in his third paſtoral:

> Not bubbling fountains to the thirſty ſwain,
> Not balmy ſleep to lab'rers faint with pain,
> Not ſhow'rs to larks, or ſun-ſhine to the bee,
> Are half ſo charming as thy ſight to me.

When King James I. after his acceſſion to the Engliſh throne, returned to Scotland in 1617, his arrival was celebrated by every effort of poetical congratulation. Upon this occaſion Drummond compoſed a panegyric intitled The Wandering Muſes, or the River Forth feaſting; in which are found four lines apparently imitated by Pope in the above paſſage, and which do not in point of harmony fall much ſhort of that imitation. He ſays,

> To virgins, flow'rs; to ſun-burnt earth, the rain;
> To mariners, fair winds amidſt the main;
> Cool ſhades, to pilgrims whom hot glances burn;
> Are not ſo pleaſing as thy bleſt return.

Of theſe two poems of Drummond, it is obſervable, that the firſt was written in 1612, the laſt in 1617. The earlieſt piece of Waller is that to the king on his navy in 1625. The piece in which Sir John Denham's greateſt force lies, Cooper's Hill, was not written till 1640. The harmony of Drummond, therefore, at a time when thoſe who are uſually called the firſt introducers of a ſmooth and poliſhed verſification had not yet begun to write, is an honour to him that ſhould never be forgotten. Nor is his excellence half enough praiſed or acknowledged.

Drummond and Petrarch had this in common, that each lamented, firſt the cruelty, and then the loſs of his miſtreſs; ſo that their ſonnets are alike naturally divided into two parts, thoſe before and thoſe after their ſeveral miſtreſſes deaths. It may juſtly be doubted, that among all the ſonneteers in the Engliſh language any one is to be preferred to Drummond. He has ſhown in ſome of theſe compoſitions nearly the ſpirit of Petrarch himſelf. Of each period one is here inſerted; the firſt, before the death of his miſtreſs:

> Ah me, and am I now the man, whoſe muſe
> In happier times was wont to laugh at love,
> In thoſe who ſuffered that blind boy abuſe
> The noble gifts were giv'n them from above!
>
> What metamorphoſe ſtrange is this I prove?
> Myſelf I ſcarce now find myſelf to be;
> And think no fable Circe's tyrannie,
> And all the tales are told of changed Jove.

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† *Curſory Remarks on ſome of the Engliſh Poets*, 8vo. 1789.

ids,
ken-
s,

Virtue hath taught, with her philoſophy,
My mind unto a better courſe to move;
Reaſon may chide her full, and oft reprove
Affection's pow'r; but what is that to me,
Who ever think, and never think on aught
But that bright cherubim which thralls my thought!

From Part II. after her death, (Sonnet I.)

Of mortal glory, O ſoon dark'ned ray!
O winged joys of man, more ſwift than wind!
O fond deſires which in our fancies ſtray!
O traiterous hopes which do our judgments blind!

Lo, in a flaſh that light is gone away,
Which dazzl'd did each eye, delight each mind;
And with that ſun from whence it came combin'd,
Now makes more radiant heav'n's eternal day.

Let Beauty now bedew her cheeks with tears;
Let widow'd Muſic only roar and groan;
Poor Virtue, get thee wings and mount the ſpheres,
For dwelling-place on earth for thee is none:
Death hath thy temple raz'd, Love's empire foil'd,
The world of honour, worth, and ſweetneſs ſpoil'd.

The ſeventh ſonnet of the firſt part has much reſemblance to Sir Henry Wotton's elegant little poem on the Queen of Bohemia, "Ye meaner beauties," &c. Among Drummond's Flowers of Sion, the poem which begins "Amidſt the azure clear—of Jordan's ſacred ſtreams," eminently diſtinguiſhes him, whether he be conſidered as a philoſopher or a poet.

Drunkenneſs.

DRUNKENNESS, a well known diſorder in the brain, occaſioned by drinking too freely of ſpirituous liquors. Drunkenneſs appears in different ſhapes in different conſtitutions: ſome it makes gay, ſome ſullen, and ſome furious. The miſchief of drunkenneſs conſiſts in the following bad effects: 1. It betrays moſt conſtitutions either into extravagancies of anger, or ſins of lewdneſs. 2. It diſqualifies men for the duties of their ſtation, both by the temporary diſorder of their faculties, and at length by a conſtant incapacity and ſtupefaction. 3. It is attended with expences, which can often be ill ſpared. 4. It is ſure to occaſion uneaſineſs to the family of the drunkard. 5. It ſhortens life. To theſe conſequences of drunkenneſs muſt be added the peculiar danger and miſchief of the example. "Drunkenneſs (Mr Paley obſerves) is a ſocial feſtive vice. The drinker collects his circle; the circle naturally ſpreads; of thoſe who are drawn within it, many become the corrupters and centres of ſets and circles of their own; every one countenancing, and perhaps emulating the reſt, till a whole neighbourhood be infected from the contagion of a ſingle example. With this obſervation upon the ſpreading quality of drunkenneſs, may be connected a remark which belongs to the ſeveral evil effects above recited. The conſequences of a vice, like the ſymptoms of a diſeaſe, though they be all enumerated in the deſcription, ſeldom all meet in the ſame ſubject. In the inſtance under conſideration, the age and temperature of one drunkard may have little to fear from inflammations of luſt or anger; the fortune of a ſecond may not be injured by the expence; a third may have no family to be diſquieted by his irregularities; and a fourth may poſſeſs a conſtitution fortified againſt the poiſon of ſtrong liquors. But if, as we always ought to do, we comprehend within the conſequences of our conduct the miſchief and tendency of the example, the above circumſtances, however fortunate for the individual, will be found to vary the guilt of his intemperance leſs, probably, than he ſuppoſes. Although the waſte of time and money may be of ſmall importance to you, it may be of the utmoſt to ſome one or other whom your ſociety corrupts. Repeated, or long continued exceſſes, which hurt not your health, may be fatal to your companion. Although you have neither wife nor child, nor parent, to lament your abſence from home, or expect your return to it with terror; other families, whoſe huſbands and fathers have been invited to ſhare in your ebriety, or encouraged to imitate it, may juſtly lay their miſery or ruin at your door. This will hold good, whether the perſon ſeduced be ſeduced immediately by you, or the vice be propagated from you to him, through ſeveral intermediate examples."

The ancient Lacedemonians uſed to make their ſlaves frequently drunk, to give their children an averſion and horror for the ſame. The Indians hold drunkenneſs a ſpecies of madneſs; and in their language, the ſame term *(ramgam)*, that ſignifies "drunkard," ſignifies alſo a "phrenetick."

Drunkenneſs is repeatedly forbidden by St Paul: "Be not drunk with wine, wherein is exceſs." "Let us walk honeſtly as in the day, not in rioting and drunkenneſs." "Be not deceived: neither fornicators, nor drunkards, nor revilers, nor extortioners, ſhall inherit the kingdom of God." Eph. v. 18. Rom. xiii. 13. 1. Cor. vi. 9, 10. The ſame apoſtle likewiſe condemns drunkenneſs, as peculiarly inconſiſtent with the Chriſtian profeſſion: "They that be drunken, are drunken in the night; but let us, who are of the day, be ſober." 1. Theſſ. v. 7, 8.

Drunkenneſs, by our laws, is looked upon as an aggravation rather than an excuſe for any criminal behaviour. A drunkard, ſays Sir Edward Coke, who is *voluntarius dæmon*, hath no privilege thereby; but what hurt or ill ſoever he doth, his drunkenneſs doth aggravate it: *nam omne crimen ebrietas, et incendit, et detergit*. It hath been obſerved that the real uſe of ſtrong liquors, and the abuſe of them by drinking to exceſs, depend much upon the temperature of the climate in which we live. The ſame indulgence which may be neceſſary to make the blood move in Norway, would make an Italian mad. A German therefore, ſays the preſident Monteſquieu, drinks through cuſtom founded upon conſtitutional neceſſity; a Spaniard drinks through choice, or out of the mere wantonneſs of luxury; and drunkenneſs, he adds, ought to be more ſeverely puniſhed where it makes men miſchievous and mad, as in Spain and Italy, than where it only renders them ſtupid and heavy, as in Germany and more northern countries. And accordingly, in the warmer climate of Greece, a law of Pittacus enacted, "that he who committed a crime when drunk, ſhould receive a double puniſhment;" one for the crime itſelf, and the other for the ebriety which prompted him to commit it. The Roman law indeed made great allowances for this vice: *per vinum delapſis capitalis pœna remittitur*. But the law of England, conſidering how eaſy it is to counterfeit this excuſe, and how weak an excuſe it is (though real), will not ſuffer any man thus to privilege one crime by another.

For the offence of drunkenneſs a man may be puniſhed in the eccleſiaſtical court, as well as by juſtices of peace by ſtatute. And by 4 *Jac.* I. *c.* 5. and 21 *Jac.* I. *c.* 7. if any perſon ſhall be convicted of

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drunkenneſs by the view of a juſtice, oath of one witneſs, &c. he ſhall forfeit 5s. for the firſt offence, to be levied by diſtreſs and ſale of his goods; and for want of a diſtreſs, ſhall ſit in the ſtocks ſix hours: and, for the ſecond offence, he is to be bound with two ſureties in 10l. each, to be of good behaviour, or to be committed. And he who is guilty of any crime thro' his own voluntary drunkenneſs, ſhall be puniſhed for it as if he had been ſober. It has been held that drunkenneſs is a ſufficient cauſe to remove a magiſtrate: and the proſecution for this offence by the ſtatute of 4 *Jac.* I. *c.* 5. was to be, and ſtill may be, before juſtices of peace in their ſeſſions by way of indictment, &c. Equity will not relieve againſt a bond, &c. given by a man when drunk, unleſs the drunkenneſs is occaſioned through the management or contrivance of him to whom the bond is given.

The appetite for intoxicating liquors appears to be almoſt always acquired. One proof of which is, that it is apt to return only at particular times and places; as after dinner, in the evening, on the market day, at the market town, in ſuch a company, at ſuch a tavern. And this may be the reaſon, that if a habit of drunkenneſs be ever overcome, it is upon ſome change of place, ſituation, company, or profeſſion. A man ſunk deep in a habit of drunkenneſs, will upon ſuch occaſions as theſe, when he finds himſelf looſened from the aſſociations which held him faſt, ſometimes make a plunge, and get out. In a matter of ſuch great importance, it is well worth while, where it is tolerably convenient, to change our habitation and ſociety, for the ſake of the experiment.

Habits of drunkenneſs commonly take their riſe either from a fondneſs for and connection with ſome company, or ſome companion, already addicted to this practice; which affords an almoſt irreſiſtible invitation to take a ſhare in the indulgencies which thoſe about us are enjoying with ſo much apparent reliſh and delight; or from want of regular employment, which is ſure to let in many ſuperfluous cravings and cuſtoms, and often this amongſt the reſt; or, laſtly, from grief or fatigue, both which ſtrongly ſolicit that relief which inebriating liquors adminiſter for the preſent, and furniſh a ſpecious excuſe for complying with the inclination. But the habit, when once ſet in, is continued by different motives from thoſe to which it owes its origin. Perſons addicted to exceſſive drinking ſuffer, in the intervals of ſobriety, and near the return of their accuſtomed indulgence, a faintneſs and oppreſſion about the *praecordia* which it exceeds the ordinary patience of human nature to endure. This is uſually relieved for a ſhort time by a repetition of the ſame exceſs: and to this relief, as to the removal of every long continued pain, they who have once experienced it are urged almoſt beyond the power of reſiſtance. This is not all: as the liquor loſes its ſtimulus, the doſe muſt be increaſed, to reach the ſame pitch of elevation or eaſe; which increaſe proportionably accelerates the progreſs of all the maladies that drunkenneſs brings on. Whoever reflects, therefore, upon the violence of the craving in advanced ſtages of the habit, and the fatal termination to which the gratification of it leads, will, the moment he perceives the leaſt tendency in himſelf of a growing inclination to intemperance, collect his reſolution to this point; or (what perhaps he will find his beſt ſecurity) arm himſelf with ſome peremptory rule, as to the times and quantity of his indulgencies.

Drupa, Druſes.

DRUPA, or Druppa, in botany, a ſpecies of *pericarpium* or ſeed-veſſel, which is ſucculent or pulpy, has no valve or external opening like the capſule and pod, and contains within its ſubſtance a ſtone or nut. The cherry, plum, peach, apricot, and all other ſtone-fruit are of this kind.

The term, which is of great antiquity, is ſynonimous to Tournefort's *fructus mollis oſſiculo*, "ſoft fruit with a ſtone;" and to the *prunus* of other botaniſts.

The ſtone or nut, which in this ſpecies of fruit is ſurrounded by the ſoft pulpy fleſh, is a kind of ligneous or woody cup, which contains a ſingle kernel or ſeed.

This definition, however, will not apply to every ſeed-veſſel denominated *drupa* in the *Genera Plantarum*. The almond is a *drupa*, ſo is the ſeed-veſſel of the elm-tree and the genus *rumphia*, though far from being pulpy or ſucculent; the firſt and third are of a ſubſtance like leather, the ſecond like parchment. The ſame may be ſaid of the walnut, piſtachia-nut, *guettarda*, *quiſqualis*, jack-in-a-box, and ſome others.

Again, the ſeeds of the elm, *ſchrebera*, *ſlagellaria*, and the mango-tree, are not contained in a ſtone. The ſeed-veſſel of burr-reed is dry, ſhaped like a top, and contains two angular ſtones.

This ſpecies of fruit, or more properly ſeed-veſſel, is commonly roundiſh, and when ſeated below the calyx or receptacle of the flower, is furniſhed, like the apple, at the end oppoſite to the foot-ſtalk, with a ſmall umbilicus or cavity, which is produced by the ſwelling of the fruit before the falling off of the flower-cup.

DRUSES, or Druzes, a remarkable nation in Paleſtine, inhabiting the environs of Mount Lebanon, of whoſe origin and hiſtory we have the following detail by M. Volney.

Twenty-three years after the death of Mahomet, the diſputes between Ali his ſon-in-law and Moaouia governor of Syria, occaſioned the firſt ſchiſm in the empire of the Arabs, and the two ſects ſubſiſt to this day: but, in reality, this difference related only to power; and the Mahometans, however divided in opinion reſpecting the rightful ſucceſſor of the prophet, were agreed with reſpect to their dogmas. It was not until the following century that the peruſal of Greek books introduced among the Arabs a ſpirit of diſcuſſion and controverſy, to which till then they were utter ſtrangers. The conſequence was, as might be expected, by reaſoning on matters not ſuſceptible of demonſtration, and guided by the abſtract principles of an unintelligible logic, they divided into a multitude of ſects and opinions. At this period, too, the civil power loſt its authority; and religion, which from that derives the means of preſerving its unity, ſhared the ſame fate, and the Mahometans now experienced what had before befallen the Chriſtians. The nations which had received the religion of Mahomet, mixed with it their former abſurd notions; and the errors which had anciently prevailed over Aſia again made their appearance, though altered in their forms. The metempſychoſis, the doctrine of a good and evil principle, and the renovation after ſix thouſand years, as it had been taught by Zoroaſter, were again revived among the

Mahometans. In this political and religious confuſion, every enthuſiaſt became an apoſtle, and every apoſtle the head of a ſect. No leſs than ſixty of theſe were reckoned, remarkable for the numbers of their followers, all differing in ſome points of faith, and all diſavowing hereſy and error. Such was the ſtate of theſe countries when at the commencement of the 11th century Egypt became the theatre of one of the moſt extravagant ſcenes of enthuſiaſm and abſurdity ever recorded in hiſtory. The following account is extracted from the eaſtern writers.

In the year of the Hejira 386 (A. D. 996), the third caliph of the race of the Fatmites, called *Hakem-b'amr-ellah*, ſucceeded to the throne of Egypt at the age of 11 years. He was one of the moſt extraordinary princes of whom hiſtory has preſerved the memory. He cauſed the firſt caliphs, the companions of Mahomet, to be curſed in the moſques, and afterwards revoked the anathema: He compelled the Jews and Chriſtians to abjure their religion, and then permitted them to reſume it. He prohibited the making ſlippers for women, to prevent them from coming out of their houſes. He burnt one half of the city of Cairo for his diverſion, while his ſoldiers pillaged the other. Not contented with theſe extravagant actions, he forbade the pilgrimage to Mecca, faſting, and the five prayers; and at length carried his madneſs ſo far as to deſire to paſs for God himſelf. He ordered a regiſter of thoſe who acknowledged him to be ſo, and the number amounted to ſixteen thouſand. This impious pretenſion was ſupported by a falſe prophet, who came from Perſia into Egypt; which impoſtor, named *Mohammad-ben-Iſmael*, taught that it was not neceſſary to faſt or pray, to practiſe circumciſion, to make the pilgrimage to Mecca, or obſerve feſtivals; that the prohibition of pork and wine was abſurd; and that marriage between brothers and ſiſters, fathers and children, was lawful. To ingratiate himſelf with Hakem, he maintained that this caliph was God himſelf incarnate; and inſtead of his name *Hakem-b'amr-ellah*, which ſignifies *governing by the order of God*, he called him *Hakem-b'amr-eh, governing by his own order*. Unluckily for the prophet, his new god had not the power to protect him from the fury of his enemies, who ſlew him in a tumult almoſt in the arms of the caliph, who was himſelf maſſacred ſoon after on mount Mokattam, where he, as he ſaid, had held converſation with angels.

The death of theſe two chiefs did not ſtop the progreſs of their opinions: a diſciple of Mohammad-ben-Iſmael, named *Hamza-ben-Ahmud*, propagated them with an indefatigable zeal in Egypt, in Paleſtine, and along the coaſt of Syria, as far as Sidon and Bergtus. His proſelytes being perſecuted by the ſect in power, they took refuge in the mountains of Lebanon, where they were better able to defend themſelves; at leaſt it is certain, that, ſhortly after this era, we find them eſtabliſhed there, and forming an independent ſociety.

The difference of their opinions diſpoſes them to be enemies; but the urgent intereſt of their common ſafety forces them to allow mutual toleration, and they have always appeared united, and have jointly oppoſed, at different times, the Cruſaders, the ſultans of Aleppo, the Mamlouks, and the Ottomans. The conqueſt of Syria by the latter, made no change in their ſituation. Selim I. on his return from Egypt, meditating no leſs than the conqueſt of Europe, diſdained to waſte his time before the rocks of Lebanon. Soliman II. his ſucceſſor, inceſſantly engaged in important wars, either with the knights of Rhodes, the Perſians, the kingdom of Yemen, the Hungarians, the Germans, or the emperor Charles V. had no time to think of the Druzes. Emboldened by this inattention, and not content with their independence, they frequently deſcended from their mountains to pillage the Turks. The pachas in vain attempted to repel their inroads; their troops were invariably routed or repulſed. And it was not till the year 1588 that Amurath III. wearied with the complaints made to him, reſolved, at all events, to reduce theſe rebels, and had the good fortune to ſucceed. His general Ibrahim Pacha marched from Cairo, and attacked the Druzes and Maronites with ſo much addreſs and vigour as to force them into their ſtrong holds, the mountains. Diſſenſion took place among their chiefs, of which he availed himſelf to exact a contribution of upwards of one million of piaſters, and to impoſe a tribute which has continued to the preſent time.

It appears that this expedition was the epocha of a conſiderable change in the conſtitution of the Druzes. Till then they had lived in a ſort of anarchy, under the command of different ſhaiks or lords. The nation was likewiſe divided into two factions, ſuch as is to be found in all the Arab tribes, and which are diſtinguiſhed into the party Kaiſi and the party Yamani. To ſimplify the adminiſtration, Ibrahim permitted them only one chief who ſhould be reſponſible for the tribute, and execute the office of civil magiſtrate; and this governor, from the nature of his ſituation, acquiring great authority, became almoſt the king of the republic; but as he was always choſen from among the Druzes, a conſequence followed which the Turks had not foreſeen, and which was nearly fatal to their power. For the chief thus choſen, having at his diſpoſal the whole ſtrength of the nation, was able to give it unanimity and energy, and it naturally turned againſt the Turks; ſince the Druzes, by becoming their ſubjects, had not ceaſed to be their enemies. They took care, however, that their attacks ſhould be indirect, ſo as to ſave appearances, and only engaged in ſecret hoſtilities, more dangerous, perhaps, than open war.

About this time, that is, the beginning of the 17th century, the power of the Druzes attained its greateſt height; which it owed to the talents and ambition of the celebrated Faker-el-din, commonly called *Fakardin*. No ſooner was this prince advanced to be the chief of that people than he turned his whole attention to humble the Ottoman power, and aggrandize himſelf at its expence. In this enterprize he diſplayed an addreſs ſeldom ſeen among the Turks. He firſt gained the confidence of the Porte, by every demonſtration of loyalty and fidelity; and as the Arabs at that time infeſted the plain of Baibek and the countries of Sour and Acre, he made war upon them, freed the inhabitants from their depredations, and thus rendered them deſirous of living under his government.

The city of Bairout was ſituated advantageouſly for his deſigns, as it opened a communication with foreign countries, and, among others, with the Venetians, the natural enemies of the Turks. Faker-el-din

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availed himſelf of the miſconduct of the Aga, expelled him, ſeized on the city, and even had the art to make a merit of this act of hoſtility with the Divan, by paying a more conſiderable tribute. He proceeded in the ſame manner at Saide Balbek and Sour; and at length, about the year 1613, ſaw himſelf maſter of all the country as far as Adjaloun and Safad. The pachas of Tripoli and Damaſcus could not ſee theſe encroachments with indifference; ſometimes they oppoſed him with open force, though ineffectually, and ſometimes endeavoured to ruin him at the Porte by ſecret inſinuations; but the Emir, who maintained there his ſpies and defenders, defeated every attempt.

At length, however, the Divan began to be alarmed at the progreſs of the Druzes, and made preparations for an expedition capable of cruſhing them. Whether from policy or fear, Faker-el-din did not think proper to wait this ſtorm. He had formed connections in Italy, on which he built great hopes, and determined to go in perſon to ſolicit the ſuccours they had promiſed him; perſuaded that his preſence would encreaſe the zeal of his friends, while his abſence might appeaſe the reſentment of his enemies. He therefore embarked at Bairout; and after reſigning the adminiſtration to his ſon Ali, repaired to the court of the Medici at Florence. The arrival of an Oriental prince in Italy did not fail to attract the public attention. Enquiry was made into his nation, and the origin of the Druzes became popular topics of reſearch. Their hiſtory and religion were found to be ſo little known as to leave it a matter of doubt whether they ſhould be claſſed with the Mahometans or Chriſtians. The Cruſades were called to mind; and it was ſoon ſuggeſted, that a people who had taken refuge in the mountains, and were enemies to the natives, could be no other than the offspring of the Cruſaders.

This idle conceit was too favourable to Faker-el-din for him to endeavour to diſprove it: he was artful enough, on the contrary, to pretend he was related to the houſe of Lorraine; and the miſſionaries and merchants, who promiſed themſelves a new opening for converſion and commerce, encouraged his pretenſions. When an opinion is in vogue, every one diſcovers new proofs of its certainty. The learned in etymology, ſtruck with the reſemblance of the names, inſiſted, that Druzes and Dreux muſt be the ſame word; and on this foundation formed the ſyſtem of a pretended colony of French Cruſaders, who, under the conduct of a Comte de Dreux, had formed a ſettlement in Lebanon. This hypotheſis, however, was completely overthrown by the remark, that the name of the Druzes is to be found in the itinerary of Benjamin of Tudela, who travelled before the time of the Cruſades. Indeed the futility of it ought to have been ſufficiently apparent at firſt, from the ſingle conſideration, that had they been deſcended from any nation of the Franks, they muſt have retained at leaſt the traces of ſome European language; for a people, retired into a ſeparate diſtrict, and living diſtinct from the natives of the country, do not loſe their language. That of the Druzes, however, is very pure Arabic, without a ſingle word of European origin. The real derivation of the name of this people has been long in our poſſeſſion without our knowing it. It originates from the founder of the ſect of Mohammad-ben-Iſmael, who was ſurnamed *El-Dorzi*, and not *El-Darari*, as it is uſually printed: the confuſion of theſe two words, ſo different in our writing, ariſes from the figure of the two Arabic letters *r* and *z*, which have only this difference, that the *z* has a point over it, frequently omitted or effaced in the manuſcripts.

After a ſtay of nine years in Italy, Faker-el-din returned to reſume the government of his country. During his abſence, his ſon Ali had repulſed the Turks, appeaſed diſcontents, and maintained affairs in tolerable good order. Nothing remained for the Emir, but to employ the knowledge he could not but have acquired, in perfecting the internal adminiſtration of government, and promoting the welfare of the nation; but inſtead of the uſeful and valuable arts, he wholly abandoned himſelf to the frivolous and expenſive, for which he had imbibed a paſſion while in Italy. He built numerous villas; conſtructed baths, and planted gardens; he even preſumed, without reſpect to the prejudices of his country, to employ the ornaments of painting and ſculpture, notwithſtanding theſe are prohibited by the Koran.

The conſequences of this conduct ſoon manifeſted themſelves: the Druzes, who paid the ſame tribute as in time of war, became diſſatisfied The Yamani faction were rouſed; the people murmured at the expences of the prince; and the luxury he diſplayed renewed the jealouſy of the pachas. They attempted to levy greater tribute: hoſtilities again commenced, and Faker-el-din repulſed the forces of the pachas; who took occaſion, from this reſiſtance, to render him ſuſpected by the ſultan himſelf. Amurath III. incenſed that one of his ſubjects ſhould dare to enter into a competition with him, reſolved on his deſtruction; and the pacha of Damaſcus received orders to march, with all his forces, againſt Bairout, the uſual reſidence of Faker-el-din; while 40 galleys inveſted it by ſea, and cut off all communication.

The Emir, who depended on his good fortune and ſuccours from Italy, determined at firſt to brave the ſtorm. His ſon Ali, who commanded at Safad, was ordered to oppoſe the progreſs of the Turkiſh army; and in fact he bravely reſiſted them, notwithſtanding the great diſparity of his forces: but after two engagements, in which he had the advantage, being ſlain in a third attack, the face of affairs were greatly changed, and every thing went to ruin. Faker-el-din, terrified at the loſs of his troops, afflicted at the death of his ſon, and enfeebled by age and a voluptuous life, loſt both courage and preſence of mind. He no longer ſaw any reſource but in a peace, which he ſent his ſecond ſon to ſolicit of the Turkiſh admiral, whom he attempted to ſeduce by preſents; but the admiral, detaining both the preſents and envoy, declared he would have the prince himſelf. Faker-el-din, intimidated, took to flight, and was purſued by the Turks, now maſters of the country. He took refuge on the ſteep eminence of Niha, where they beſieged him ineffectually for a whole year, when they left him at liberty: but ſhortly after, the companions of his adverſity, wearied with their ſufferings, betrayed and delivered

delivered him up to the Turks. Faker-el-din, though in the hands of his enemies, conceived hopes of pardon, and ſuffered himſelf to be carried to Conſtantinople; where Amurath, pleaſed to behold at his feet a prince ſo celebrated, at firſt treated him with that benevolence which ariſes from the pride of ſuperiority; but ſoon returning to his former jealouſies, yielded to the inſtigations of his courtiers, and, in one of his violent fits of paſſion, ordered him to be ſtrangled, about the year 1631.

After the death of Faker-el-din, the poſterity of that prince ſtill continued in poſſeſſion of the government, though at the pleaſure, and as vaſſals, of the Turks. This family failing in the male line at the beginning of the preſent century, the authority devolved, by the election of the ſhaiks, on the houſe of Shelah, in which it ſtill continues. The only emir of that houſe, whoſe name deſerves to be preſerved, is the emir Melhem, who reigned from 1740 to 1759; in which interval he retrieved the loſſes of the Druzes, and reſtored them to that conſequence which they had loſt by the defeat of Faker-el-din. Towards the end of his life, about the year 1754, Melhem, wearied with the cares of government, abdicated his authority, to live in religious retirement, after the manner of the Okkals; but the troubles that ſucceeded occaſioned him once more to reſume the reins of government, which he held till 1759, when he died, univerſally regretted.

He left three ſons, minors: the eldeſt of whom ought, according to the cuſtom of the country, to have ſucceeded him; but being only 11 years of age, the authority devolved on his uncle Manſour, agreeable to a law very general in Aſia, which wills the people to be governed by a ſovereign who has arrived at years of maturity. The young prince was but little fitted to maintain his pretenſions: but a Maronite, named Sad-el-Kouri, to whom Melhem had entruſted his education, took this upon himſelf. Aſpiring to ſee his pupil a powerful prince, that he might himſelf become a powerful viſir, he made every exertion to advance his fortune. He firſt retired with him to Djebail, in the Keſraouan, where the emir Youſef poſſeſſed large domains, and there undertook to conciliate the Maronites, by embracing every opportunity to ſerve both individuals and the nation. The great revenues of his pupil, and the moderation of his expenditure, amply furniſhed him with the means. The farm of the Keſraouan was divided between ſeveral ſhaiks, with whom the Porte was not very well ſatisfied. Sad treated for the whole with the pacha of Tripoli, and got himſelf appointed ſole receiver. The Motoualis of the valley of Balbek had for ſome years before made ſeveral encroachments on Lebanon, and the Maronites began to be alarmed at the near approach of theſe intolerant Mahometans. Sad purchaſed of the pacha of Damaſcus a permiſſion to make war upon them; and in 1763 drove them out of the country. The Druzes were at that time divided into two factions: Sad united his intereſt with thoſe who oppoſed Manſour, and ſecretly prepared the plot which was to raiſe the nephew on the ruin of the uncle.

At this period the Arab Daher, who had made himſelf maſter of Galilee, and fixed his reſidence at Acre, diſquieted the Porte by his progreſs and pretenſions: to oppoſe him, the Divan had juſt united the pachalics of Damaſcus, Saide, and Tripoli, in the hands of Oſman and his children; and it was evident, that an open war was not very remote. Manſour, who dreaded the Turks too much to reſiſt them, made uſe of the policy uſual on ſuch occaſions, pretending a zeal for their ſervice, while he ſecretly favoured their enemy. This was a ſufficient motive for Sad to purſue meaſures directly oppoſite. He ſupported the Turks againſt the faction of Manſour, and manœuvered with ſo much good fortune or addreſs as to depoſe that emir in 1770, and place Youſef in his government.

In the following year Ali Bey declared war and attacked Damaſcus. Youſef, called on by the Turks, took part in the quarrel, but without being able to draw the Druzes from their mountains to enter into the army of the Ottomans. Beſides their natural repugnance, at all times, to make war out of their country, they were on this occaſion too much divided at home to quit their habitations, and they had reaſon to congratulate themſelves on the event. The battle of Damaſcus enſued; and the Turks, as we have already ſeen, were completely routed. The pacha of Saide eſcaping from this defeat, and not thinking himſelf in ſafety in that town, ſought an aſylum even in the houſe of the emir Youſef. The moment was unfavourable; but the face of affairs ſoon changed by the flight of Mohammad Bey. The emir, concluding that Ali Bey was dead, and not imagining that Daher was powerful enough ſingly to maintain the quarrel, declared openly againſt him. Saide was threatened with a ſiege, and he detached 1500 men of his faction to its defence; while himſelf in perſon, prevailing on the Druzes and Maronites to follow him, made an incurſion with 25,000 peaſants into the valley of Bekaa; and in the abſence of the Motoualis, who had joined the army of Daher, laid the whole country waſte with fire and ſword from Balbek to Tyre.

While the Druzes, proud of this exploit, were marching in diſorder towards the latter city, 500 Motoualis, informed of what had happened, flew from Acre inflamed with rage and deſpair, and fell with ſuch impetuoſity on their army as to give them a complete overthrow. Such was the ſurpriſe and confuſion of the Druzes, that, imagining themſelves attacked by Daher himſelf and betrayed by their companions, they turned their ſwords on each other as they fled. The ſteep declivities of Djezin, and the pine-woods which were in the route of the fugitives, were ſtrewed with dead, but few of whom periſhed by the hands of the Motoualis.

The emir Youſef, aſhamed of this defeat, eſcaped to Dair-el-Kamar, and ſhortly after attempted to take revenge; but being again defeated in the plain between Saide and Sour (Tyre), he was conſtrained to reſign to his uncle Manſour the ring, which among the Druzes is the ſymbol of command. In 1773 he was reſtored by a new revolution; but he could not ſupport his power but at the expence of a civil war. In order, therefore, to prevent Bairout falling into the hands of the adverſe faction, he requeſted the aſſiſtance of the Turks, and demanded of the pacha of Damaſcus a man of ſufficient abilities to defend that city. The

choice

choice fell on an adventurer ; who, from his ſubſequent fortune, merits to be made known.

This man, named Ahmad, is a native of Boſnia, and ſpeaks the Sclavonian as his mother tongue, as the Raguſan captains, with whom he converſes in preference to thoſe of every other nation, aſſert. It is ſaid, that flying from his country at the age of 16, to eſcape the conſequences of an attempt to violate his ſiſter-in-law, he repaired to Conſtantinople, where, deſtitute of the means of procuring a ſubſiſtence, he ſold himſelf to the ſlave-merchants to be conveyed to Egypt ; and, on his arrival at Cairo, was purchaſed by Ali Bey, who placed him among his Mamlouks.

Ahmad was not long in diſtinguiſhing himſelf by his courage and addreſs. His patron employed him on ſeveral occaſions in dangerous *coups de main*, ſuch as the aſſaſſination of ſuch beys and cachefs as he ſuſpected ; of which commiſſions he acquitted himſelf ſo well as to acquire the name of *Djezzar*, which ſignifies *Cut-throat*. With this claim to his friendſhip, he enjoyed the favour of Ali until it was diſturbed by an accident.

This jealous Bey having proſcribed one of his benefactors called Saleh Bey, commanded Djezzar to cut off his head. Either from humanity or ſome ſecret friendſhip for the devoted victim, Djezzar heſitated, and even remonſtrated againſt the order. But learning the next day that Mohammed Bey had executed the commiſſion, and that Ali had ſpoken of him not very favourably, he thought himſelf a loſt man, and, to avoid the fate of Saleh Bey, eſcaped unobſerved, and reached Conſtantinople. He there ſolicited employments ſuitable to his former rank ; but meeting, as is uſual in capitals, with a great number of rivals, he purſued another plan, and went to ſeek his fortune in Syria as a private ſoldier. Chance conducted him among the Druzes, where he was hoſpitably entertained, even in the houſe of the kiaya of the emir Youſef. From thence he repaired to Damaſcus, where he ſoon obtained the title of *Aga*, with a command of five pair of colours, that is to ſay, of 50 men ; and he was thus ſituated when fortune deſtined him to the government of Bairout.

Djezzar was no ſooner eſtabliſhed there than he took poſſeſſion of it for the Turks. Youſef was confounded at this proceeding. He demanded juſtice at Damaſcus ; but finding his complaints treated with contempt, entered into a treaty with Daher, and concluded an offenſive and defenſive alliance with him at Ras-el-aen, near to Sour. No ſooner was Daher united with the Druzes than he laid ſiege to Bairout by land, whilſt two Ruſſian frigates, whoſe ſervice was purchaſed by 600 purſes, cannonaded it by ſea. Djezzar was compelled to ſubmit to force, and, after a vigorous reſiſtance, gave up the city and ſurrendered himſelf priſoner. Shaik Daher, charmed with his courage, and flattered with the preference he had given him in the ſurrender, conducted him to Acre, and ſhowed him every mark of kindneſs. He even ventured to truſt him with a ſmall expedition into Paleſtine ; but Djezzar, on approaching Jeruſalem, went over to the Turks and returned to Damaſcus.

The war of Mohammed Bey breaking out, Djezzar offered his ſervice to the captain Pacha, and gained his confidence. He accompanied him to the ſiege of Acre ; and that admiral having deſtroyed Daher, and finding no perſon more proper than Djezzar to accompliſh the deſigns of the Porte in that country, named him pacha of Saide.

Being now, in conſequence of this revolution, ſuperior lord to the emir Youſef, Djezzar is mindful of injuries in proportion as he has reaſon to accuſe himſelf of ingratitude. By a conduct truly Turkiſh, feigning alternately gratitude and reſentment, he is alternately on terms of diſpute and reconciliation with him, continually exacting money as the price of peace, or as indemnity for war. His artifices have ſucceeded ſo well, that within the ſpace of five years he has extorted from the emir four millions of French money (above L. 160,000), a ſum the more aſtoniſhing, as the farm of the country of the Druzes did not then amount to 100,000 livres (L. 4000).

In 1784 he made war on him, depoſed him, and beſtowed the government on the emir of the country of Haſbeya, named Iſmael. Youſef, having once more purchaſed his favour, returned towards the end of the ſame year to Dair-el-Kamar, and even courted his confidence ſo far as to wait on him at Acre, from whence nobody expected him to return ; but Djezzar is too cunning to ſhed blood while there are any hopes of getting money : he releaſed the prince, and ſent him back with every mark of friendſhip. Since that period the Porte has named him pacha of Damaſcus, while he alſo retained the ſovereignty of the pachalic of Acre, and of the country of the Druzes.

As to the religion of the Druzes : What has been already ſaid of the opinions of Mohammed-ben-Iſmael may be regarded as the ſubſtance of it. They practiſe neither circumciſion, nor prayers, nor faſting ; they obſerve neither feſtivals nor prohibitions. They drink wine, eat pork, and allow marriage between brothers and ſiſters, though not between fathers and children. From this we may conclude, with reaſon, that the Druzes have no religion ; yet one claſs of them muſt be excepted, whoſe religious cuſtoms are very peculiar. Thoſe who compoſe it are to the reſt of the nation what the initiated were to the profane ; they aſſume the name of *Okkals*, which means ſpiritualiſts, and beſtow on the vulgar the epithet of *Djahel* or ignorant ; they have various degrees of initiation, the higheſt orders of which require celibacy. Theſe are diſtinguiſhable by the white turban they affect to wear, as a ſymbol of their purity ; and ſo proud are they of this ſuppoſed purity, that they think themſelves ſullied by even touching a profane perſon. If you eat out of their plate, or drink out of their cup, they break them ; and hence the cuſtom, ſo general in this country, of uſing vaſes with a ſort of cock, which may be drank out of without touching them with the lips. All their practices are enveloped in myſteries : their oratories always ſtand alone, and are conſtantly ſituated on eminences : in theſe they hold their ſecret aſſemblies, to which women are admitted. It is pretended they perform ceremonies there in preſence of a ſmall ſtatue reſembling an ox or a calf ; whence ſome have pretended to prove that they are deſcended from the Samaritans. But beſides that the fact is not well aſcertained, the worſhip of the ox may be deduced from other ſources.

They have one or two books, which they conceal with the greateſt care: but chance has deceived their jealouſy; for in a civil war which happened 9 or 10 years ago, the emir Youſef, who is *Djahel* or ignorant, found one among the pillage of one of their oratories. M. Volney was aſſured, by perſons who had read it, that it contains only a myſtic jargon, the obſcurity of which doubtleſs renders it valuable to adepts. Hakem Bamr-ellah is there ſpoken of, by whom they mean God incarnated in the perſon of the caliph. It likewiſe treats of another life, of a place of puniſhment, and a place of happineſs where the Okkals ſhall of courſe be moſt diſtinguiſhed. Several degrees of perfection are mentioned, to which they arrive by ſucceſſive trials. In other reſpects, theſe ſectaries have all the inſolence and all the fears of ſuperſtition: they are not communicative, becauſe they are weak; but it is probable that, were they powerful, they would be promulgators and intolerant.

The reſt of the Druzes, ſtrangers to this ſpirit, are wholly indifferent about religious matters. The Chriſtians who live in their country pretend that ſeveral of them believe in the metempſychoſis; that others worſhip the ſun, moon, and ſtars: all which is poſſible; for, as among the Anſaria, every one, left to his own fancy, follows the opinion that pleaſes him moſt; and theſe opinions are thoſe which preſent themſelves moſt naturally to unenlightened minds. When among the Turks, they affect the exterior of Mahometans, frequent the moſques, and perform their ablutions and prayers. Among the Maronites, they accompany them to church, and, like them, make uſe of holy water. Many of them, importuned by the miſſionaries, ſuffer themſelves to be baptized; and if ſolicited by the Turks, receive circumciſion, and conclude by dying neither Chriſtians nor Mahometans; but they are not ſo indifferent in matters of civil policy.

The Druzes may be divided into two claſſes: the common people; and the people of eminence and property, diſtinguiſhed by the title of ſhaiks and emirs, or deſcendants of princes. The greater part are cultivators, either as farmers or proprietors; every man lives on his inheritance, improving his mulberry-trees and vineyards: in ſome diſtricts they grow tobacco, cotton, and ſome grain, but the quantity of theſe is inconſiderable. It appears that at firſt all the lands were, as formerly in Europe, in the hands of a ſmall number of families. But to render them productive, the great proprietors were forced to ſell part of them, and let leaſes; which ſubdiviſion is become the chief ſource of the power of the ſtate, by multiplying the number of perſons intereſted in the public weal: there ſtill exiſts, however, ſome traces of the original inequality, which even at this day produces pernicious effects. The great property poſſeſſed by ſome families gives them too much influence in all the meaſures of the nation; and their private intereſts have too great weight in every public tranſaction. Their hiſtory, for ſome years back, affords ſufficient proofs of this; ſince all the civil or foreign wars in which they have been engaged have originated in the ambition and perſonal views of ſome of the principal families, ſuch as the Leſbeks, the Djambelats, the Iſmaels of Solyma, &c. The ſhaiks of theſe houſes, who alone poſſeſs one-tenth part of the country, procured creatures by their money, and at laſt involved all the Druzes in their diſſenſions. It muſt be owned, however, that poſſibly to this conflict between contending parties the whole nation owes the good fortune of never having been enſlaved by its chief.

This chief, called *Hakem* or governor, alſo *Emir* or prince, is a ſort of king or general, who unites in his own perſon the civil and military powers. His dignity is ſometimes tranſmitted from father to ſon, ſometimes from one brother to another; and the ſucceſſion is determined rather by force than any certain laws. Females can in no caſe pretend to this inheritance. They are already excluded from ſucceſſion in civil affairs, and conſequently can ſtill leſs expect it in political: in general, the Aſiatic governments are too turbulent, and their adminiſtration renders military talents too neceſſary, to admit of the ſovereignty of women. Among the Druzes, the male line of any family being extinguiſhed, the government devolves to him who is in poſſeſſion of the greateſt number of ſuffrages and reſources. But the firſt ſtep is to obtain the approbation of the Turks, of whom he becomes the vaſſal and tributary. It even happens, that, not unfrequently to aſſert their ſupremacy, they name the Haken, contrary to the wiſhes of the nation, as in the caſe of Iſmael Haſbeya, raiſed to that dignity by Djezzar; but this conſtraint laſts no longer than it is maintained by that violence which gave it birth. The office of the governor is to watch over the good order of the ſtate, and to prevent the Emirs, Shaiks, and villages, from making war on each other: in caſe of diſobedience, he may employ force. He is alſo at the head of the civil power, and names the Cadis, only always reſerving to himſelf the power of life and death. He collects the tribute, from which he annually pays to the pacha a ſtated ſum. This tribute varies in proportion as the nation renders itſelf more or leſs formidable: at the beginning of this century, it amounted to 160 purſes, L. 8330; but Melhem forced the Turks to reduce it to 60. In 1784, Emir Youſef paid 80 and promiſed 90. This tribute, which is called *Miri*, is impoſed on the mulberry-trees, vineyards, cotton, and grain. All ſown land pays in proportion to its extent; every foot of mulberries is taxed at three medins, or three ſols nine deniers (not quite two-pence). A hundred feet of vineyard pays a piaſter or 40 medins; and freſh meaſurements are often made to preſerve a juſt proportion. The ſhaiks and emirs have no exemption in this reſpect; and it may be truly ſaid they contribute to the public ſtock in proportion to their fortune. The collection is made almoſt without expence. Each man pays his contingent at Dair-el-Kamer, if he pleaſes, or to the collectors of the prince, who make a circuit round the country after the crop of ſilks. The ſurplus of this tribute is for the prince; ſo that it is his intereſt to reduce the demands of the Turks, as it would be likewiſe to augment the impoſt: but this meaſure requires the ſanction of the ſhaiks, who have the privilege of oppoſing it. Their conſent is neceſſary, likewiſe, for peace and war. In theſe caſes, the emir muſt convoke general aſſemblies, and lay before them the ſtate of his affairs. There every ſhaik, and every peaſant who has any reputation for courage or underſtanding, is intitled to give his ſuffrage; ſo that this government may be conſidered as a well-proportioned mixture of monarchy, ariſtocracy, and democracy. Every thing depends on circumſtances : if the governor be a man of ability, he is abſolute; if weak, a cypher. This proceeds from the want of fixed laws ; a want common to all Aſia, and the radical cauſe of all the diſorders in the governments of the Aſiatic nations.

Neither the chief nor the individual emirs maintain troops; they have only perſons attached to the domeſtic ſervice of their houſes, and a few black ſlaves. When the nation makes war, every man, whether ſhaik or peaſant, able to bear arms, is called upon to march. He takes with him a little bag of flour, a muſket, ſome bullets, a ſmall quantity of powder, made in his village, and repairs to the rendezvous appointed by the governor. If it be a civil war, as ſometimes happens, the ſervants, the farmers, and their friends, take up arms for their patron, or the chief of their family, and repair to his ſtandard. In ſuch caſes, the parties irritated frequently ſeem on the point of proceeding to the laſt extremities ; but they ſeldom have recourſe to acts of violence, or attempt the death of each other ; mediators always interpoſe, and the quarrel is appeaſed the more readily as each patron is obliged to provide his followers with proviſions and ammunition. This ſyſtem, which produces happy effects in civil troubles, is attended with great inconvenience in foreign wars, as ſufficiently appeared in that of 1784. Djezzar, who knew that the whole army lived at the expence of the emir Youſef, aimed at nothing but delay, and the Druzes, who were not diſpleaſed at being fed for doing nothing, prolonged the operations ; but the emir, wearied of paying, concluded a treaty, the terms of which were not a little rigorous for him, and eventually for the whole nation, ſince nothing is more certain than that the intereſts of a prince and his ſubjects are always inſeparable.

" The ceremonies to which I have been a witneſs on theſe occaſions (ſays M. Volney), bear a ſtriking reſemblance to the cuſtoms of ancient times. When the emir and the ſhaiks had determined on war at Daer-el-Kamar, cryers in the evening aſcended the ſummits of the mountain; and there began to cry with a loud voice: 'To war, to war; take your guns, take your piſtols: noble ſhaiks, mount your horſes ; arm yourſelves with the lance and ſabre ; rendezvous to morrow at Dair-el-Kamar. Zeal of God ! zeal of combats !' This ſummons, heard from the neighbouring villages, was repeated there; and as the whole country is nothing but a chain of lofty mountains and deep valleys, the proclamation paſſed in a few hours to the frontiers. Theſe voices, from the ſtillneſs of the night, the long reſounding echoes, and the nature of the ſubject, had ſomething awful and terrible in their effect. Three days after 15000 armed men rendezvouzed at Dair-el-Kamar, and operations might have been immediately commenced.

" We may eaſily imagine that troops of this kind no way reſemble our European ſoldiers ; they have neither uniforms, nor diſcipline, nor order. They are a crowd of peaſants with ſhort coats, naked legs, and muſkets in their hands ; differing from the Turks and Mamlouks in that they are all foot ; the ſhaiks and emirs alone having horſes, which are of little uſe from the rugged nature of the country. War there can only be a war of poſts. The Druzes never riſk themſelves in the plain; and with reaſon: for they would be unable to ſtand the ſhock of cavalry, having no bayonets to their muſkets. Their whole art conſiſts in climbing rocks, creeping among the buſhes and blocks of ſtone; from whence their fire is the more dangerous, as they are covered, fire at their eaſe, and by hunting and military ſports have acquired the habit of hitting a mark with great dexterity. They are accuſtomed to ſudden inroads, attacks by night, ambuſcades, and all thoſe *coups de main* which require to fall ſuddenly on, and come to cloſe fight with the enemy. Ardent in improving their ſucceſs, eaſily diſpirited, and prompt to reſume their courage; daring even to temerity, and ſometimes ferocious, they poſſeſs above all two qualities eſſential to the excellency of any troops ; they ſtrictly obey their leaders, and are endowed with a temperance and vigour of health at this day unknown to moſt civilized nations. In the campaign of 1784, they paſſed three months in the open air without tents, or any other covering than a ſheep-ſkin ; yet were there not more deaths or maladies than if they had remained in their houſes. Their proviſions conſiſted, as at other times, of ſmall loaves baked on the aſhes or on a brick, raw onions, cheeſe, olives, fruits, and a little wine. The table of the chiefs was almoſt as frugal; and we may affirm, that they ſubſiſted 100 days, on what the ſame number of Engliſhmen or Frenchmen would not have lived ten. They have no knowledge of the ſcience of fortification, the management of artillery or encampments, nor, in a word, any thing which conſtitutes the art of war. But had they among them a few perſons verſed in military ſcience, they would readily acquire its principles, and become a formidable ſoldiery. This would be the more eaſily effected, as their mulberry plantations and vineyards do not occupy them all the year, and they could afford much time for military exerciſes."

By the laſt eſtimates, according to M. Volney's information, the number of men able to bear arms was 40,000, which ſuppoſes a total population of 120,000: no addition is to be made to this calculation, ſince there are no Druzes in the cities or on the coaſt. As the whole country contains only 110 ſquare leagues, there reſults for every league 1090 perſons ; which is equal to the population of our richeſt provinces. To render this more remarkable, it muſt be obſerved that the ſoil is not fertile, that a great many eminences remain uncultivated, that they do not grow corn enough to ſupport themſelves three months in the year, that they have no manufactures, and that all their exportations are confined to ſilks and cottons, the balance of which exceeds very little the importation of corn from the Hauran, the oils of Paleſtine, and the rice and coffee they procure from Bairout. Whence ariſes then ſuch a number of inhabitants within ſo ſmall a ſpace ? " I can diſcover no other cauſe (ſays our author), than that ray of liberty which glimmers in this country. Unlike the Turks, every man lives in a perfect ſecurity of his life and property. The peaſant is not richer than in other countries ; but he is free. 'He fears not,' as I have often heard them ſay, 'that the Aga, the Kaimmakam, or the Pacha, ſhould ſend their Djendis to pillage his houſe, carry off his family, or give him the baſtinado.' Such oppreſſions are unknown among theſe mountains. Security, therefore, has been the original cauſe of population, from that inherent deſire which all men have to multiply themſelves wherever they find an eaſy ſubſiſtence. The frugality of the nation which is content with little, has been a ſecondary, and not leſs powerful reaſon; and a third is the emigration

emigration of a number of Chriſtian families, who daily deſert the Turkiſh provinces to ſettle in Mount Lebanon, where they are received with open arms by the Maronites from ſimilarity of religion, and by the Druzes from principles of toleration, and a conviction how much it is the intereſt of every country to multiply the number of its cultivators, conſumers, and allies.

“ The compariſon which the Druzes often have an opportunity of making between their ſituation and that of other ſubjects of the Turkiſh government, has given them an advantageous opinion of their ſuperiority, which, by a natural effect, has an influence on their perſonal character. Exempt from the violence and inſults of deſpotiſm, they conſider themſelves as more perfect than their neighbours, becauſe they have the good fortune not to be equally debaſed. Hence they acquire a character more elevated, energetic, and active; in ſhort, a genuine republican ſpirit. They are conſidered throughout the Levant as reſtleſs, enterpriſing, hardy, and brave even to temerity. Only 300 of them have been ſeen to enter Damaſcus in open day, and ſpread around them terror and carnage. No people are more nice than they with reſpect to the point of honour: Any offence of that kind, or open inſult, is inſtantly puniſhed by blows of the kandjur or the muſket; while among the inhabitants of the towns, it only excites injurious retorts. This delicacy has occaſioned in their manners and diſcourſe a reſerve, or, if you will, a politeneſs, which one is aſtoniſhed to diſcover among peaſants. It is carried even to diſſimulation and falſehood, eſpecially among the chiefs, whoſe greater intereſts demand greater attentions. Circumſpection is neceſſary to all, from the formidable conſequences of that retaliation of which I have ſpoken. Theſe cuſtoms may appear barbarous to us; but they have the merit of ſupplying the deficiency of regular juſtice, which is neceſſarily tedious and uncertain in theſe diſorderly and almoſt anarchical governments.

“ The Druzes have another point of honour, that of hoſpitality. Whoever preſents himſelf at their door in the quality of a ſuppliant or paſſenger, is ſure of being entertained with lodging and food in the moſt generous and unaffected manner. M. Volney often ſaw the loweſt peaſants give the laſt morſel of bread they had in their houſes to the hungry traveller; and when it was obſerved to them that they wanted prudence, their anſwer was, ‘ God is liberal and great, and all men are brethren.’ There are, therefore, no inns in their country any more than in the reſt of Turkey. When they have once contracted with their gueſt the ſacred engagement of bread and ſalt, no ſubſequent event can make them violate it. Various inſtances of this are related, which do honour to their character. A few years ago, an aga of the janiſſaries having been engaged in a rebellion, fled from Damaſcus and retired among the Druzes. The pacha was informed of this, and demanded him of the emir, threatening to make war on him in caſe of refuſal. The emir demanded him of the ſhaik Talhouk, who had received him; but the indignant ſhaik replied, ‘ When you have known the Druzes deliver up their gueſts? Tell the emir, that as long as Talhouk ſhall preſerve his beard, not a hair of the head of his ſuppliant ſhall fall!’ The emir threatened him with force; Talhouk armed his family. The emir, dreading a revolt, adopted a method practiſed as juridical in that country. He declared to the ſhaik, that he would cut down 50 mulberry-trees a-day until he ſhould give up the aga. He proceeded as far as a thouſand, and Talhouk ſtill remained inflexible. At length the other ſhaiks, enraged, took up the quarrel; and the commotion was about to become general, when the aga, reproaching himſelf with being the cauſe of ſo much miſchief, made his eſcape without the knowledge even of Talhouk.

“ The Druzes have alſo the prejudices of the Bedouins reſpecting birth; like them, they pay great reſpect to the antiquity of families; but this produces no eſſential inconveniences. The nobility of the emirs and ſhaiks does not exempt them from paying tribute in proportion to their revenues. It confers on them no prerogatives, either in the attainment of landed property or public employments. In this country, no more than in all Turkey, are they acquainted with game-laws, or glebes, or ſeigniorial or eccleſiaſtical tithes, franc fiefs or alienation fines; every thing is held in freehold: Every man, after paying his miri and his rent, is maſter of his property. In ſhort, by a particular privilege, the Druzes pay no fine for their ſucceſſion; nor does the emir, like the ſultan, arrogate to himſelf original and univerſal property: there exiſts, nevertheleſs, in the law of inheritance, an imperfection which produces diſagreeable effects. Fathers have, as in the Roman law, the power of preferring ſuch of their children as they think proper: hence it has happened in ſeveral families of the ſhaiks, that the whole property has centered in the ſame perſon, who has perverted it to the purpoſe of intriguing and caballing, while his relations remain, as they well expreſs it, *princes of olives and cheeſe*; that is to ſay, poor as peaſants.

“ In conſequence of their prejudices, the Druzes do not chooſe to make alliances out of their own families. They invariably prefer their relation, though poor, to a rich ſtranger; and poor peaſants have been known to refuſe their daughters to merchants of Saide and Bairout, who poſſeſſed from twelve to fifteen thouſand piaſtres. They obſerve alſo, to a certain degree, the cuſtom of the Hebrews, which directed that a brother ſhould eſpouſe his brother's widow; but this is not peculiar to them, for they retain that as well as ſeveral other cuſtoms of that ancient people, in common with other inhabitants of Syria and all the Arab tribes.

“ In ſhort, the proper and diſtinctive character of the Druzes is a ſort of republican ſpirit, which gives them more energy than any other ſubjects of the Turkiſh government, and an indifference for religion, which forms a ſtriking contraſt with the zeal of the Mahometans and Chriſtians. In other reſpects, their private life, their cuſtoms and prejudices, are the ſame with other orientals. They may marry ſeveral wives, and repudiate them when they chooſe; but, except by the emir and a few men of eminence, that is rarely practiſed. Occupied with their rural labours, they experience neither artificial wants, nor thoſe inordinate paſſions which are produced by the idleneſs of the inhabitants of cities and towns. The veil, worn by their women, is of itſelf a preſervative againſt thoſe deſires which are the occaſion of ſo many evils in ſociety.

ciety. No man knows the face of any other woman than his wife, his mother, his ſiſter, and ſiſters-in-law. Every man lives in the boſom of his own family, and goes little abroad. The women, thoſe even of the ſhaiks, make the bread, roaſt the coffee, waſh the linen, cook the victuals, and perform all domeſtic offices. The men cultivate their lands and vineyards, and dig canals for watering them. In the evening they ſometimes aſſemble in the court, the area, or houſe of the chief of the village or family. There, ſeated in a circle, with legs croſſed, pipes in their mouths, and poniards at their belts, they diſcourſe of their various labours, the ſcarcity or plenty of their harveſts, peace or war, the conduct of the emir, or the amount of the taxes; they relate paſt tranſactions, diſcuſs preſent intereſts, and form conjectures on the future. Their children, tired with play, come frequently to liſten; and a ſtranger is ſurpriſed to hear them, at ten or twelve years old, recounting, with a ſerious air, why Djezzar declared war againſt the emir Youſef, how many purſes it coſt that prince, what augmentation there will be of the miri, how many muſkets there were in the camp, and who had the beſt mare. This is their only education. They are neither taught to read the pſalms as among the Maronites, nor the koran like the Mahometans; hardly do the ſhaiks know how to write a letter. But if their mind be deſtitute of uſeful or agreeable information, at leaſt it is not preoccupied by falſe and hurtful ideas; and, without doubt, ſuch natural ignorance is well worth all our artificial folly. This advantage reſults from it, that their underſtandings being nearly on a level, the inequality of conditions is leſs perceptible. For, in fact, we do not perceive among the Druzes that great diſtance which, in moſt other ſocieties, degrades the inferior, without contributing to the advantage of the great. All, whether ſhaiks or peaſants, treat each other with that rational familiarity, which is equally remote from rudeneſs and ſervility. The grand emir himſelf is not a different man from the reſt: he is a good country gentleman, who does not diſdain admitting to his table the meaneſt farmer. In a word, their manners are thoſe of ancient times, and of that ruſtic life which marks the origin of every nation; and prove that the people among whom they are ſtill found are as yet only in the infancy of the ſocial ſtate."

DRUSIUS (John), a Proteſtant writer of great learning, born at Oudenarde in Flanders in 1555. He was deſigned for the ſtudy of divinity; but his father being outlawed, and deprived of his eſtate, they both retired to England, where the ſon became profeſſor of the oriental languages at Oxford: but upon the pacification of Ghent, they returned to their own country, where Druſius was alſo appointed profeſſor of the oriental languages. From thence he removed to Frieſland, where he was admitted Hebrew profeſſor in the univerſity of Franeker; the functions of which he diſcharged with great honour till his death in 1616. His works ſhow him to have been well ſkilled in Hebrew; and the States General employed him in 1600 to write notes on the moſt difficult paſſages in the Old Teſtament, with a penſion of 400 florins a-year: but being frequently diſturbed in this undertaking, it was not publiſhed till after his death. He held a vaſt correſpondence with the learned; for beſides letters in Hebrew, Greek, and other languages, there were found 2300 Latin letters among his papers. He had a ſon John, who died in England at 21, and was a prodigy for his early acquiſition of learning; he wrote Notes on the Proverbs of Solomon, with many letters and verſes in Hebrew.

DRYADS, in the heathen theology, a ſort of deities, or nymphs, which the ancients thought inhabited groves and woods. They differed from the Hamadryades; theſe latter being attached to ſome particular tree, with which they were born, and with which they died; whereas the Dryades were goddeſſes of trees and woods in general. See HAMADRYADES.

DRYAS, in botany: A genus of the polygynia order, belonging to the icoſandria claſs of plants; and in the natural method ranking under the 35th order, *Senticoſæ*. The calyx is octofid; the petals eight; the ſeeds long and hairy with a train.

DRYDEN (John), one of the moſt eminent Engliſh poets of the 17th century, deſcended of a genteel family in Huntingdonſhire, was born in that county at Oldwincle 1631, and educated at Weſtminſter ſchool under Dr Buſhby. From thence he was removed to Cambridge in 1650, being elected ſcholar of Trinity-college, of which he appears, by his *Epithalamia Cantabrigienſ.* 4to, 1662, to have been afterwards a fellow. Yet in his earlier days he gave no extraordinary indication of genius; for even the year before he quitted the univerſity, he wrote a poem on the death of Lord Haſtings, which was by no means a preſage of that amazing perfection in poetical powers which he afterwards poſſeſſed.

On the death of Oliver Cromwell he wrote ſome heroic ſtanzas to his memory; but on the Reſtoration, being deſirous of ingratiating himſelf with the new court, he wrote firſt a poem intitled *Aſtræa Redux*, and afterwards a panegyric to the king on his coronation. In 1662, he addreſſed a poem to the lord chancellor Hyde, preſented on New Year's day; and in the ſame year a ſatire on the Dutch. In 1668 appeared his *Annus Mirabilis*, which was an hiſtorical poem in celebration of the duke of York's victory over the Dutch. Theſe pieces at length obtained him the favour of the crown; and Sir William Davenant dying the ſame year, Mr Dryden was appointed to ſucceed him as poet laureat. About this time alſo his inclination to write for the ſtage ſeems firſt to have ſhown itſelf. For beſides his concern with Sir William Davenant in the alteration of Shakeſpeare's Tempeſt, in 1669 he produced his Wild Gallants, a comedy. This met with very indifferent ſucceſs; yet the author, not being diſcouraged by its failure, ſoon publiſhed his Indian Emperor. This finding a more favourable reception, encouraged him to proceed; and that with ſuch rapidity, that in the key to the Duke of Buckingham's Rehearſal he is recorded to have engaged himſelf by contract for the writing of four plays per year; and, indeed, in the years 1679 and 1680 he appears to have fulfilled that contract. To this unhappy neceſſity that our author lay under, are to be attributed all thoſe irregularities, thoſe bombaſtic flights, and ſometimes even puerile exuberances, for which he has been ſo ſeverely criticiſed; and which, in the unavoidable hurry in which he wrote, it was impoſſible he ſhould find time either for lopping away or correcting.

In 1675, the Earl of Rocheſter, whoſe envious and malevolent diſpoſition would not permit him to ſee growing merit meet with its due reward, and was therefore ſincerely chagrined at the very juſt applauſe with which Mr Dryden's dramatic pieces had been received, was determined if poſſible to ſhake his intereſt at court; and ſucceeded ſo far as to recommend Mr Crowne, an author by no means of equal merit, and at that time of an obſcure reputation, to write a maſk for the court, which certainly belonged to Mr Dryden's office as poet laureat.—Nor was this the only attack, nor indeed the moſt potent one, that Mr Dryden's juſtly acquired fame drew on him. For, ſome years before, the Duke of Buckingham, a man of not much better character than Lord Rocheſter, had moſt ſeverely ridiculed ſeveral of our author's plays in his admired piece called the *Rehearſal*. But though the intrinſic wit which runs through that performance cannot even to this hour fail of exciting our laughter, yet at the ſame time it ought not to be the ſtandard on which we ſhould fix Mr Dryden's poetical reputation, if we conſider, that the pieces there ridiculed are not any of thoſe looked on as the *chef d'œuvres* of this author; that the very paſſages burleſqued are frequently, in their original places, much leſs ridiculous than when thus detached, like a rotten limb, from the body of the work; and expoſed to view with additional diſtortions, and diveſted of that connection with the other parts, which, while preſerved, gave it not only ſymmetry but beauty; and laſtly, that the various inimitable beauties, which the critic has ſunk in oblivion, are infinitely more numerous than the deformities which he has thus induſtriouſly brought forth to our more immediate inſpection.

Mr Dryden, however, did not ſuffer theſe attacks to paſs with impunity; for in 1679 there came out an Eſſay on Satire, ſaid to be written jointly by that gentleman and the Earl of Mulgrave, containing ſome very ſevere reflections on the Earl of Rocheſter and the Ducheſs of Portſmouth, who, it is not improbable, might be a joint inſtrument in the above-mentioned affront ſhown to Mr Dryden; and in 1681 he publiſhed his Abſalom and Achitophel, in which the well-known character of Zimri, drawn for the Duke of Buckingham, is certainly ſevere enough to repay all the ridicule thrown on him by that nobleman in the character of Bays.—The reſentment ſhown by the different peers was very different. Lord Rocheſter, who was a coward as well as a man of the moſt depraved morals, baſely hired three ruffians to cudgel Dryden in a coffeehouſe: but the Duke of Buckingham, as we are told, in a more open manner, took the taſk upon himſelf: and at the ſame time preſented him with a purſe containing no very trifling ſum of money; telling him, that he gave him the beating as a puniſhment for his impudence, but beſtowed that gold on him as a reward for his wit.

In 1680 was publiſhed a tranſlation of Ovid's Epiſtles in Engliſh verſe by ſeveral hands, two of which, together with the preface, were by Mr Dryden; and in 1682 came out his *Religio Laici*, deſigned as a defence of revealed religion, againſt Deiſts, Papiſts, &c. Soon after the acceſſion of King James II. our author changed his religion for that of the church of Rome, and wrote two pieces in vindication of the Romiſh tenets; viz. A Defence of the Papers written by the late King, found in his ſtrong box; and the celebrated poem, afterwards anſwered by Lord Halifax, intitled The Hind and the Panther.—By this extraordinary ſtep he not only engaged himſelf in controverſy, and incurred much cenſure and ridicule from his cotemporary wits; but on the completion of the Revolution, being, on account of his newly-choſen religion, diſqualified from bearing any office under the government, he was ſtripped of the laurel, which, to his ſtill greater mortification, was beſtowed on Richard Flecknoe, a man to whom he had a moſt ſettled averſion. This circumſtance occaſioned his writing the very ſevere poem called *Mac Flecknoe*.

Mr Dryden's circumſtances had never been affluent; but now being deprived of this little ſupport, he found himſelf reduced to the neceſſity of writing for mere bread. We conſequently find him from this period engaged in works of labour as well as genius, *viz.* in tranſlating the works of others; and to this neceſſity perhaps our nation ſtands indebted for ſome of the beſt tranſlations extant. In the year he loſt the laurel, he publiſhed the life of St Francis Xavier from the French. In 1693 came out a tranſlation of Juvenal and Perſius; in the firſt of which he had a conſiderable hand, and of the latter the entire execution. In 1695 was publiſhed his proſe verſion of Freſnoy's Art of Painting; and the year 1697 gave the world that tranſlation of Virgil's works entire, which ſtill does, and perhaps ever will, ſtand foremoſt among the attempts made on that author. The petite pieces of this eminent writer, ſuch as prologues, epilogues, epitaphs, elegies, ſongs, &c. are too numerous to ſpecify here, and too much diſperſed to direct the reader to. The greateſt part of them, however, are to be found in a collection of miſcellanies in 6 vols 12mo. His laſt work is what is called his *Fables*, which conſiſts of many of the moſt intereſting ſtories in Homer, Ovid, Boccace, and Chaucer, tranſlated or modernized in the moſt elegant and poetical manner; together with ſome original pieces, among which is that amazing ode on St Cecilia's day, which, though written in the very decline of the author's life, and at a period when old age and diſtreſs conſpired as it were to damp his poetic ardor and clip the wings of fancy, yet poſſeſs ſo much of both, as would be ſufficient to have rendered him immortal had he never written a ſingle line beſides.

Dryden married the lady Elizabeth Howard, ſiſter to the Earl of Berkſhire, who ſurvived him eight years; though for the laſt four of them ſhe was a lunatic, having been deprived of her ſenſes by a nervous fever.—By this lady he had three ſons; Charles, John, and Henry. Of the eldeſt of theſe there is a circumſtance related by Charles Wilſon, Eſq; in his Life of Congreve, which ſeems ſo well atteſted, and is itſelf of ſo very extraordinary a nature, that we cannot avoid giving it a place here.—Dryden, with all his underſtanding, was weak enough to be fond of judicial aſtrology, and uſed to calculate the nativity of his children. When his lady was in labour with his ſon Charles, he being told it was decent to withdraw, laid his watch on the table, begging one of the ladies then preſent, in a moſt ſolemn manner, to take exact notice of the very minute that the child was born; which ſhe did, and acquainted him with it. About a week after, when his lady was pretty well recovered, Mr Dryden took occaſion to tell her that he had been calculating the child's nativity; and obſerved, with grief, that he was born in an evil hour: for Jupiter, Venus, and the Sun, were all under the earth, and the lord of his aſcendant afflicted with a hateful ſquare of Mars and Saturn. "If he lives to arrive at the 8th year," ſays he, "he will go near to die a violent death on his very birth-day; but if he ſhould eſcape, as I ſee but ſmall hopes, he will in the 23d year be under the very ſame evil direction; and if he ſhould eſcape that alſo, the 33d or 34th year is, I fear"——Here he was interrupted by the immoderate grief of his lady, who could no longer hear calamity propheſied to befal her ſon. The time at laſt came, and Auguſt was the inauſpicious month in which young Dryden was to enter into the eighth year of his age. The court being in progreſs, and Mr Dryden at leiſure, he was invited to the country-ſeat of the Earl of Berkſhire his brother-in-law, to keep the long vacation with him in Charleton in Wilts; his lady was invited to her uncle Mordaunt's to paſs the remainder of the ſummer. When they came to divide the children, lady Elizabeth would have him take John, and ſuffer her to take Charles: but Mr Dryden was too abſolute, and they parted in anger; he took Charles with him, and ſhe was obliged to be content with John. When the fatal day came, the anxiety of the lady's ſpirits occaſioned ſuch an efferveſcence of blood, as threw her into ſo violent a fever, that her life was deſpaired of, till a letter came from Mr Dryden, reproving her for her womaniſh credulity, and aſſuring her that her child was well; which recovered her ſpirits, and in ſix weeks after ſhe received an eclairciſſement of the whole affair. Mr Dryden, either through fear of being reckoned ſuperſtitious, or thinking it a ſcience beneath his ſtudy, was extremely cautious of letting any one know that he was a dealer in aſtrology; therefore could not excuſe his abſence, on his ſon's anniverſary, from a general hunting-match which Lord Berkſhire had made, to which all the adjacent gentlemen were invited. When he went out, he took care to ſet the boy a double exerciſe in the Latin tongue, which he taught his children himſelf, with a ſtrict charge not to ſtir out of the room till his return; well knowing the taſk he had ſet him would take up longer time. Charles was performing his duty in obedience to his father; but, as ill fate would have it, the ſtag made towards the houſe; and the noiſe alarming the ſervants, they haſted out to ſee the ſport. One of them took young Dryden by the hand, and led him out to ſee it alſo; when, juſt as they came to the gate, the ſtag being at bay with the dogs, made a bold puſh, and leaped over the court-wall, which was very low and very old; and the dogs following, threw down a part of the wall 10 yards in length, under which Charles Dryden lay buried. He was immediately dug out; and after ſix weeks languiſhing in a dangerous way, he recovered. So far Dryden's prediction was fulfilled. In the 23d year of his age, Charles fell from the top of an old tower belonging to the Vatican at Rome, occaſioned by a ſwimming in his head with which he was ſeized, the heat of the day being exceſſive. He again recovered, but was ever after in a languiſhing ſickly ſtate. In the 33d year of his age, being returned to England, he was unhappily drowned at Windſor. He had with another gentleman ſwam twice over the Thames; but returning a third time, it was ſuppoſed he was taken with the cramp, becauſe he called out for help, though too late. Thus the father's calculation proved but too prophetical.

At laſt, after a long life, haraſſed with the moſt laborious of all fatigues, *viz.* that of the mind, and continually made anxious by diſtreſs and difficulty, our author departed this life on the firſt of May 1701.—The day after Mr Dryden's death, the dean of Weſtminſter ſent word to Mr Dryden's widow, that he would make a preſent of the ground and all other abbey-fees for the funeral: the Lord Halifax likewiſe ſent to the lady Elizabeth, and to Mr Charles Dryden, offering to defray the expences of our poet's funeral, and afterwards to beſtow 500 l. on a monument in the abbey; which generous offer was accepted. Accordingly, on Sunday following, the company being aſſembled, the corpſe was put into a velvet hearſe, attended by 18 mourning coaches. When they were juſt ready to move, Lord Jefferys, ſon of Lord Chancellor Jefferys, a name dedicated to infamy, with ſome of his rakiſh companions, riding by, aſked whoſe funeral it was; and being told it was Mr Dryden's, he proteſted he ſhould not be buried in that private manner; that he would himſelf, with the lady Elizabeth's leave, have the honour of the interment, and would beſtow 1000l. on a monument in the abbey for him. This put a ſtop to their proceſſion; and the Lord Jefferys, with ſeveral of the gentlemen who had alighted from their coaches, went up ſtairs to the lady, who was ſick in bed. His lordſhip repeated the purport of what he had ſaid below; but the lady Elizabeth refuſing her conſent, he fell on his knees, vowing never to riſe till his requeſt was granted. The lady under a ſudden ſurpriſe fainted away; and Lord Jefferys, pretending to have obtained her conſent, ordered the body to be carried to Mr Ruſſel's an undertaker in Cheapſide, and to be left there till further orders. In the mean time the abbey was lighted up, the ground opened, the choir attending, and the biſhop waiting ſome hours to no purpoſe for the corpſe. The next day Mr Charles Dryden waited on the Lord Halifax and the biſhop; and endeavoured to excuſe his mother, by relating the truth. Three days after, the undertaker, having received no orders, waited on the Lord Jefferys; who pretended that it was a drunken frolic, that he remembered nothing of the matter, and he might do what he pleaſed with the body. Upon this the undertaker waited upon the lady Elizabeth, who deſired a day's reſpite, which was granted. Mr Charles Dryden immediately wrote to the Lord Jefferys, who returned for anſwer, that he knew nothing of the matter, and would be troubled no more about it. Mr Dryden hereupon applied again to Lord Halifax and the Biſhop of Rocheſter, who abſolutely refuſed to do any thing in the affair.

In this diſtreſs, Dr Garth, who had been Mr Dryden's intimate friend, ſent for the corpſe to the college of phyſicians, and propoſed a ſubſcription; which ſucceeding, about three weeks after Mr Dryden's deceaſe, Dr Garth pronounced a fine Latin oration over the body, which was conveyed from the college, attended by a numerous train of coaches to Weſtminſter-abbey, but in very great diſorder. At laſt the corpſe arrived at the abbey, which was all unlighted. No organ played, en.

ed, no anthem ſung; only two of the ſinging boys preceding the corpſe, who ſung an ode of Horace, with each a ſmall candle in their hand. When the funeral was over, Mr Charles Dryden ſent a challenge to Lord Jefferys; who refuſing to anſwer it, he ſent ſeveral others, and went often himſelf; but could neither get a letter delivered, nor admittance to ſpeak to him: which ſo incenſed him, that finding his Lordſhip refuſed to anſwer him like a gentleman, he reſolved to watch an opportunity, and brave him to fight, though with all the rules of honour; which his Lordſhip hearing, quitted the town, and Mr Charles never had an opportunity to meet him, though he ſought it to his death with the utmoſt application.

Mr Dryden had no monument erected to him for ſeveral years; to which Mr Pope alludes in his epitaph intended for Mr Rowe, in this line,

> Beneath a rude and nameleſs ſtone he lies.

In a note upon which we are informed that the tomb of Mr Dryden was erected upon this hint by Sheffield duke of Buckingham, to which was originally intended this epitaph:

> This *Sheffield* raiſ'd.—The ſacred duſt below
> Was *Dryden* once; the reſt, who does not know?

Which was ſince changed into the plain inſcription now upon it, *viz.*

J. DRYDEN,
*Natus* Aug. 9. 1631.
*Mortuus* Maii 1. 1701.
*Johannes Sheffeld, dux Buckinghamienſis fecit.*

Mr Dryden's character has been very differently drawn by different hands, ſome of which have exalted it to the higheſt degree of commendation, and others debaſed it by the ſevereſt cenſure.—The latter, however, we muſt charge to that ſtrong ſpirit of party which prevailed during great part of Dryden's time, and ought therefore to be taken with great allowances. Were we indeed to form a judgment of the author from ſome of his dramatic writings, we ſhould perhaps be apt to conclude him a man of the moſt licentious morals; many of his comedies containing a great ſhare of looſeneſs, even extending to obſcenity: But if we conſider, that, as the poet tells us,

> Thoſe who live to pleaſe, muſt pleaſe to live;

if we then look back to the ſcandalous licence of the age he lived in, the indigence which at times he underwent, and the neceſſity he conſequently lay under of complying with the public taſte however depraved; we ſhall ſurely not refuſe our pardon to the compelled writer, nor our credit to thoſe of his cotemporaries who were intimately acquainted with him, and who have aſſured us there was nothing remarkably vicious in his perſonal character.

From ſome parts of his hiſtory he appears unſteady, and to have too readily temporized with the ſeveral revolutions in church and ſtate. This however might in ſome meaſure have been owing to that natural timidity and diffidence in his diſpoſition, which almoſt all the writers ſeem to agree in his poſſeſſing. Congreve, whoſe authority cannot be ſuſpected, has given us ſuch an account of him, as makes him appear no leſs amiable in his private character as a man, than he was illuſtrious in his public one as a poet. In the former light, according to that gentleman, he was humane, compaſſionate, forgiving, and ſincerely friendly; of an extenſive reading, a tenacious memory, and a ready communication: gentle in the correction of the writings of others, and patient under the reprehenſion of his own deficiencies: eaſy of acceſs himſelf, but ſlow and diffident in his advances to others; and of all men the moſt modeſt and the moſt eaſy to be diſcountenanced in his approaches either to his ſuperiors or his equals. As to his writings, he is perhaps the happieſt in the harmony of his numbers, of any poet who ever lived either before or ſince his time, not even Mr Pope himſelf excepted. His imagination is ever warm, his images noble, his deſcriptions beautiful, and his ſentiments juſt and becoming. In his proſe he is poetical without bombaſt, conciſe without pedantry, and clear without prolixity. His dramatic have, perhaps, the leaſt merit of all his writings. Yet there are many of them which are truly excellent; though he himſelf tells us that he never wrote any thing in that way to pleaſe himſelf but his *All for Love*. This laſt, indeed, and his *Spaniſh Friar*, may be reckoned two of the beſt plays our language has been honoured with.

Drypis, Dublin.

DRYPIS, in botany: A genus of the trigynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 22d order, *Caryophyllei*. The calyx is quinquedentated; the petals five; the opening at the capſule as if cut round horizontally, monoſpermous.

DUBLIN, the metropolis of Ireland, the ſecond city in his majeſty's dominions, and eſteemed the fifth for magnitude in Europe, is ſituated in the province of Leinſter, in the county of Dublin, at the bottom of a large bay. The river Liffey, which here diſembogues itſelf into the ocean, divides the town into nearly two equal parts. Formerly the city of Dublin was confined to the ſouth ſide of the river: it was a place of great antiquity. Ptolemy, who flouriſhed in the reign of Antoninus Pius, about the year 140, ſays, it was anciently called *Aſchcled*. In 155, Alpinus, whoſe daughter Auliana was drowned in the Liffey, changed the name from *Aſchcled* to *Auliana*. It was afterwards named *Dublana*, and Ptolemy calls it *Eblana*. *Dublana*, whence comes *Dublinum* and *Dublin*, is evidently derived from *Dub-leana*, "the place of the black harbour or lake," or rather "the lake of the ſea," the bay of Dublin being frequently ſo called. This city has had a variety of names. The Iriſh call it *Drom-choll-coil*, "the brow of a hazle wood;" and in 181, Eogan king Munſter being on a royal tour, paid a viſit to this place, which was then called *Atha Cliath-Dubb-Line*, "the paſſage of the ford of hurdles over the black pool:" the harbour of Dublin was likewiſe known by the name of *Lean-Cliath*, or *Leam-Cliath*, from *Lean* or *Leam*, "a harbour;" and from *Cliath* or *Cliabb*, which literally ſignifies "a hurdle or any thing made of wicker-work;" it alſo ſignified certain wires formed with hurdles, and placed in rivers and bays by the ancient Iriſh for the purpoſe of taking fiſh: whence any river or bay wherein theſe wires were fixed had the name of *Cliath* or *Cliabb* annexed to it, to ſignify the eſtabliſhment of a fiſhery. Dublin, therefore, being originally built on or near one of theſe harbours, was anciently called *Baly-lean-Cliath*, that is, the town on the fiſhing harbour. It is deſcribed at the preſent day in the Iriſh language by the appellations of *Ath-Cliath*, "the ford of hurdles," and *Bally-ath-Cliath*, "the town of the ford

ford of hurdles," the inhabitants having formerly had acceſs to the river by hurdles laid on the low marſhy grounds adjoining the water: and this name was alſo extended to the north ſide of the river, from a temporary bridge of hurdles thrown over the Anna Liffey, a corruption of *Auin Louiſſa*, or "the ſwift river," ſo termed from the rapidity of the mountain floods. This ſide was enlarged by Mac Turkill the Daniſh prince, who, notwithſtanding, fixed his habitation on the ſouth ſide, and abandoned the northern town; which, from the original country of the invaders, was called *Eaſtmantown*, ſince corrupted to *Oxmantown*. King Edgar, in the preface to his charter dated 964, mentions Ireland with its moſt noble city (*nobiliſſima civitas*) of *Dublin*. By the Fingallians it is called *Divelin*, and by the Welch *Dinas-Dulin*, or *the city of Duin*.

In 448, Alpin Mac Eachard, king of Dublin and all his ſubjects, were converted to Chriſtianity by St Patrick.

In the year 498, the Oſtmen or Danes having entered the Liffey with a fleet of 60 ſail, made themſelves maſters of Dublin and the adjacent country, and ſoon after environed the city with walls. About 1170 Dermot Mac Murrough, king of Leinſter, having quarrelled with the other princes of the kingdom, a confederacy was formed againſt him by Roderick O'Conor, monarch of Ireland. Dermot applied to Henry II. king of England, who ſent over a number of Engliſh adventurers, by whoſe aſſiſtance he was reinſtated in his dominions; and in the year 1171, the deſcendants of the Danes ſtill continuing to hold poſſeſſion of Dublin, it was beſieged and taken by a powerful party of the Engliſh under Raymond le Groſs. Mac Turkill the Daniſh king eſcaped to his ſhipping: he returned, however, ſoon after with a ſtrong fleet to recover the city, but was killed in the attempt, and in him ended the race of eaſterling princes in Ireland.

In 1172, Henry II. landed at Waterford, and obtained from Richard earl of Strongbow (who married the daughter of Dermot Mac Murrough, and by compact was his ſucceſſor) a ſurrender of the city of Dublin, where he built a pavilion of wicker work near St Andrew's church, then ſituated where Caſtlemarket lately ſtood, and there entertained ſeveral Iriſh princes, who voluntarily ſubmitted to him, on condition of being governed by the ſame laws as the people of England. Henry alſo held a parliament here. In 1173 he granted his firſt charter to Dublin, and by divers privileges encouraged a colony from Briſtol to ſettle here.

In 1210, upwards of 20 Iriſh princes ſwore allegiance to king John at Dublin; engaging to eſtabliſh the Engliſh laws and cuſtoms in the kingdom; and in the ſame year courts of judicature were inſtituted. In 1216, magna charta was granted to the Iriſh by Henry III. an entry of which was made in the red book of the exchequer at Dublin. In 1217, the city was granted to the citizens in fee farm at 200 marks *per annum*; and in 1227 the above monarch ordained that the charter granted by king John ſhould be kept inviolably. In 1404, the ſtatutes of Kilkenny and Dublin were confirmed in a parliament held at this city under the earl of Ormond. The charter of the city of Dublin was renewed in 1609 by James I.

The civil government of the city was anciently under the management of a provoſt and bailiffs; in 1308, John le Decer was appointed the firſt provoſt, and Richard de St Olave and John Stakebold bailiffs. In 1409, the title of the chief magiſtrate was changed to that of mayor, when Thomas Cuſack was appointed to the office, Richard Bove and Thomas Shortall being bailiffs: the office of bailiffs was changed to ſheriffs in 1547. In 1660, Charles II. gave a collar of SS. and a company of foot guards to the mayor; and in 1665, this monarch conferred the title of lord mayor on the chief magiſtrate, to whom he alſo granted 500l. *per annum* in lieu of the foot company. Sir Daniel Bellingham was the firſt lord mayor of Dublin; Charles Lovet and John Quelſh were ſheriffs the ſame year. In 1672, Arthur earl of Eſſex introduced new rules for the better government of the city; and in 1683 the Tholſel was built, for the purpoſe of the magiſtrates meeting to hold their courts, aſſemblies, &c.

In the 10th century, after the fortifications of Dublin were repaired by the Oſtmen, the walls of the city, including thoſe of the caſtle, did not occupy more than an Iriſh mile; they extended from Winetavern-gate to Audeon's-arch, and were continued from thence to where Newgate formerly ſtood; and from a plan publiſhed by John Speed in 1610, it appears that they were continued to Ormond's-gate, or, as it has been ſince called, *Wormwood-gate*, from thence to the Old-bridge, and along the banks of the river to a very large portal called *Newman's tower*, nearly in the preſent ſite of the ſouth entrance of Eſſex-bridge; and from Newman's tower in an angular direction to Dame's-gate, at the weſt-end of Dame-ſtreet. From the gate at the ſouth-weſt angle of the caſtle the wall ran to Nicholas-gate, and was continued from thence to Newgate. The principal ſtreets without the walls were, on the weſt, New-row, Francis-ſtreet, Thomas-ſtreet, and James's-ſtreet; on the ſouth were Patrick-ſtreet, Bride-ſtreet, and Ship-ſtreet; and on the eaſt Dame-ſtreet, George's-lane, and Stephen-ſtreet. That ſpace of ground now occupied by Crane-lane, Temple-bar, Fleet-ſtreet, Lazar's-hill, or, as it is now called *ſouth Townſend-ſtreet*, Crampton, Aſton's, George's, and Sir John Rogerſon's quays, &c. was then overflowed by the Liffey. On the north ſide of the river there were only Church-ſtreet, Mary's-lane, Hammond-lane, and Pill-lane, then built but on one ſide as far as Mary's-abbey, which terminated the extent of that part of the town to the eaſtward; Grange-Gorman, Stoney-batter, now called *Manor-ſtreet*, and Glaſſmanogue, were then villages at ſome diſtance from the city; and at the latter the ſheriffs have held their courts in times of the plague, as being remote from the ſtage of infection. In 1664, the inhabitants being numbered amounted to 2565 men and 2986 women, proteſtants; and 1202 men and 1406 women, Roman catholics, making in the whole 8159.

By comparing this account of the ancient ſtate and boundaries of the metropolis with the following deſcription of its preſent extent, population, and magnificence, an idea will be readily formed of the amazing increaſe and improvement it hath experienced within the preſent century.

Dublin is ſeated in view of the ſea on the eaſt, and a fine country which ſwells into gently riſing eminences

nences on the north and weſt, while it towers boldly up in lofty mountains that bound the horizon on the ſouth. The city itſelf cannot be ſeen to full advantage on entering the harbour: but the approach to it from thence exhibits a fine proſpect of the country for improvement and cultivation, interſperſed with numerous villas, that have a moſt agreeable effect to enliven this delightful ſcene, which, beginning at the water's edge, is continued all over the coaſt to the northward of the bay as far as the eye can reach, and is finely contraſted by a diſtant view of the Wicklow mountains to the ſouth, where the conical hills, called the *Sugar-loaves*, contribute not a little, by the ſingularity of their appearance, to embelliſh the landſcape, ſo extenſive and pictureſque as not to be equalled by any natural ſcenery in Europe, but the entrance of the bay of Naples, to which it bears a very ſtriking reſemblance.

The form of Dublin is nearly a ſquare, a figure that includes the largeſt area proportioned to its circumference. From the royal hoſpital at Kilmainham, at the weſtern extremity of the town, to the eaſt end of Townſend-ſtreet, the length is two miles and an half, and its greateſt breadth is computed to be of the ſame extent: hence the city is about 10 miles in circumference. Its increaſe within the laſt twenty years has been amazing: it now contains about 22,000 houſes, whoſe inhabitants are eſtimated at 156,000.

Dublin, with reſpect to its ſtreets, bears a near reſemblance to London. Some of the old ſtreets were formerly narrow: but this defect is now in a great meaſure remedied by an act of parliament, paſſed in 1774, for opening the public avenues, taking down ſign-poſts, paliſades, pent-houſes, &c. new paving the ſtreets, and flagging the foot paſſages: and, in 1785, another act paſſed for the better paving, cleanſing, and lighting the city; in conſequence of which an additional number of globes with double burners were put up at the diſtance of 36 feet from each other. Theſe neceſſary improvements contribute exceedingly to the beauty and convenience of the metropolis: the new ſtreets are wide and commodious, the houſes lofty, uniform, and elegant; nor are ſeveral of the old ſtreets totally deficient in theſe reſpects: Sackville-ſtreet, or the Mall, which, though built upwards of 40 years ago, has been included in the number of our new ſtreets by all the late geographers (a ſelf-evident proof that theſe writers had not even ſeen the city), is a noble avenue, with a gravel walk in the centre, encloſed by a wall of about three feet high; this walk is 36 feet and a half broad, and the diſtance between it and the paliſades fronting the houſes, on either ſide, is 42 feet and a half: when the new cuſtom-houſe is completed, this ſtreet will be then a moſt deſirable ſituation for wholeſale merchants, not only on account of its proximity to that building, but its great depth in the rere. Some years ago, it was eſteemed one of the fineſt public avenues in Europe: many of the new ſtreets, however, in this city are now much ſuperior to it in the magnificence and uniformity of the houſes. Among theſe, on the north ſide of the river, in the ſame quarter with Sackville-ſtreet, are Gardiner's-row, north Great George's-ſtreet, Cranby-row, Cavendiſh-row, and Palace-row: the laſt three form a ſuperb ſquare, having the garden of the lying-in-hoſpital in the centre: the old wall that encompaſſed the garden has been lately taken down; there is now a full view of this delightful ſpot ſurrounded with iron paliſades, and upward of 100 globes with double burners diſpoſed at equal diſtances, which, added to the globes from the ſurrounding houſes, have a moſt brilliant effect. This ſquare, which, for its ſize, is not perhaps to be equalled, has lately received the name of Rutland-ſquare, in compliment to his grace the preſent duke of Rutland, who contributed munificently towards the improvements in the encloſure of the new garden, and the erecting an elegant edifice for a ball and ſupper rooms, now nearly finiſhed, ſituated to the eaſt of the hoſpital.

Among the new ſtreets and buildings on the ſouth ſide of the river, thoſe wherein perſons of diſtinction reſide, lie chiefly to the eaſtward of the college and Stephen's-green; which laſt, though it does not rank with the new buildings, poſſeſſes much grandeur and elegance, being one of the largeſt ſquares in Europe: it is an Engliſh mile in circumference, ſurrounded by a gravel walk planted on each ſide with trees; within this walk is a ſmooth level meadow, having in the centre an equeſtrian ſtatue of the late king: there are ſeveral fine edifices, though almoſt all differing in the ſtile of their architecture; this variety, however, is eſteemed by many rather a beauty than a defect: but, beſides the other ſtreets and buildings in this quarter, there is a new ſquare which will be nearly as extenſive as Stephen's-green, called *Merion-ſquare;* it was laid out ſome years ago, by the late lord Fitzwilliam; the buildings are now conſiderably advanced, and great encouragement has been given by the preſent noble proprietor: the houſes on the north ſide, which is quite finiſhed, are uniform and lofty; moſt of them, being carried up with hewn ſtone to the firſt ſtory, gives the whole an air of ſtrength, beauty, and magnificence. At the ſouth weſt angle of Stephen's-green, a new ſtreet has been alſo opened, called *Harcourt-ſtreet*, in which are ſeveral elegant ſtructures that merit notice, particularly the town reſidence of the right honourable lord Earlsford.

The principal entrance to the walks of Stephen's-green is on the weſt ſide oppoſite the end of York-ſtreet (which may be properly claſſed among the new ſtreets), as all the old houſes have been pulled down and modern buildings erected in their room. Thoſe parts of the city inhabited by merchants and traders begin to wear a new face; and amongſt this number the new buildings of Dame-ſtreet on the ſouth ſide, exhibit an extenſive, uniform, and beautiful range of houſes all of an equal height: the ſhop doors and windows are formed by arches, exactly ſimilar in their conſtruction and ornaments, which are ſimply elegant: when the other ſide of this ſtreet ſhall be rebuilt, it may be juſtly pronounced one of the firſt trading ſtreets in Europe; and Parliament-ſtreet, which was built ſome years ago, is now nearly equal to any trading ſtreet in London.

The river Liffey, being banked in through the whole length of the town, exhibits ſpacious and beautiful quays, where veſſels below the bridge load and unload before the merchants doors and warehouſes: it is navigable as far as Eſſex-bridge. This bridge was firſt built in 1681, and took its name from the unfortunate

tunate earl of Eſſex, then viceroy of Ireland. It was taken down in 1753, and rebuilt in an elegant form, after the model of Weſtminſter bridge, but much better proportioned, and on a more ſecure foundation. It has five arches, the buttreſſes between which ſupport ſemicircular niches that project from the parapet; there are balluſtrades between theſe niches, and continued to the ends of the bridge, which is commodiouſly flagged for foot paſſages; the whole conſtructed with hewn ſtone in a very fine taſte. There are four bridges beſides this over the river; three of which have nothing to recommend them, further than the antiquity of the Old-Bridge, which was erected in this city at a very early period, when it had the name of *Dublin-Bridge;* it was rebuilt in 1428, ſince which time it received its preſent title. Bloody-bridge, built in 1671, was originally conſtructed with wood, and derives it preſent harſh appellation from an attempt to break it down, wherein four perſons were killed. Ormond-bridge was built in 1684, during the Ormond adminiſtration. Arran-bridge, now called *Queen's-bridge*, was erected in the ſame year; but, being deſtroyed by the floods in 1763, was rebuilt of hewn ſtone, and finiſhed in 1768. It conſiſts of three arches, with flagged foot paſſages, ſtone balluſtrades and ornamental decorations, in a handſome light ſtyle, admired by every amateur of the arts.

This city has 2 cathedrals, 18 pariſh churches, 2 chapels of eaſe, 15 Roman-catholic chapels, 6 meeting-houſes for preſbyterians, 1 for anabaptiſts, 4 for methodiſts, 2 for quakers, a church for French Calviniſts, a Daniſh and a Dutch church, and a Jewiſh ſynagogue.

Chriſt-church, or the Holy Trinity, built in 1038 by Donat biſhop of Dublin, to whom Sitricus the ſon of Amlave king of the Oſtmen of Dublin granted the ſite for that purpoſe, ſtands on the ſummit of the riſing ground at the head of Winetavern-ſtreet. It is a venerable Gothic pile; and its preſent appearance evinces its antiquity. St Patrick's cathedral, firſt built by archbiſhop Comyn in 1190, and decorated by archbiſhop Minot in 1370, with a ſteeple on which a lofty ſpire was erected in 1750, is alſo a fine Gothic ſtructure: it ſtands on the eaſt ſide of Patrick-ſtreet; the monuments here are more numerous than in Chriſt-church; and the ſteeple is the higheſt in the city.

St Werburgh's church was originally built in a very early age. In 1301, when a great part of the city was conſumed by an accidental fire, this church ſuffered in the conflagration: it was burnt a ſecond time in 1754, and repaired in its preſent beautiful form in 1759. The front and ſteeple are admired for their elegance, lightneſs, and ſymmetry: the ſpire is a fine octagon ſupported by eight pillars; and a gilt ball terminates the whole, being 160 feet from the ground. Catharine's church firſt built in 1105, and re-edified in its preſent form in 1769, is ſituated on the ſouth ſide of Thomas's-ſtreet. St Thomas's church is the lateſt foundation of the kind in this city, having been begun in the year 1758, and finiſhed and conſecrated in 1762. It is ſituated on the weſt ſide of Marlborough-ſtreet, oppoſite Glouceſter-ſtreet, to which it forms an elegant termination. The other churches in this city are; on the north ſide of the river, Mary's, Michan's, and Paul's; on the ſouth ſide, James's, Luke's, Kevin's, Peter's, Bride's, Nicholas within, Audeon's, Michael's, Mark's, Anne's, John's, and Andrew's; this laſt is called alſo the *Round church*, from its form being exactly circular: moſt, if not all the others were built in an early age: many, however, have been ſince re-edified, and aſſumed a more modern form: ſome of theſe are not totally devoid of elegance, particularly Anne's. St John's in Fiſhamble-ſtreet was rebuilt in 1773, and has now a handſome front of hewn ſtone decorated with columns ſupporting a pediment. Beſides theſe churches, Dublin is adorned with ſeveral other public buildings; the moſt remarkable of which are the following: The caſtle, the reſidence of the chief governor, built in 1213 by Henry de Londres, was formerly moated and flanked with towers; but the ditch has been long ſince filled up, and the old buildings raſed, the chapel and wardrobe tower excepted, which ſtill remain: Birmingham tower was rebuilt in 1777, and is now called *Harcourt tower*. The caſtle at preſent conſiſts of two courts, the principal of which is an oblong ſquare formed by four ranges of building: within a few years, in the middle of the ſouth range, a handſome ediſice called *Bedford tower* has been erected; the front is decorated with a ſmall arcade of three arches, over which is a colonade ſupporting a pediment, from whence riſes an octagon ſteeple crowned with a ſmall cupola and gilt ball in a light pleaſing ſtyle. This tower, which fronts the entrance to the viceroy's apartments, is connected with the buildings on each ſide by two fine gates; over that on the right hand is a ſtatue of Fortitude; and over the left gate, which is the grand portal to the upper court, is the ſtatue of Juſtice. In the lower court are the treaſury and other offices, with military ſtores, an arſenal and armory for 40,000 men, and a barrack in which a captain's detachment of infantry are ſtationed. Between this barrack and the arſenal is the caſtle garden; oppoſite to which, at the rere of the lord Lieutenat's apartments, is a range of building called the *Garden-front*, erected about the year 1740, finiſhed in mountain ſtone, ornamented by ſemicolumn of the Ionic order, and the windows embelliſhed with cornices and architraves, in a fine taſte. The ball-room is now titled St *Patrick's Hall*. The viceroy's body guard conſiſts of a captain, two ſubalterns, and ſixty private men, with a ſubaltern's guard of horſe. The parliament houſe, a moſt ſuperb ſtructure, is ſituated on the north ſide of college-green: it was begun in 1729, finiſhed in 10 years, and coſt 40,000 l. it is built with Portland ſtone, and the front formed by a grand portico of Ionic columns in the moſt finiſhed ſtyle of architectural elegance: the internal parts (which have been lately much improved, under the auſpices of the preſent ſpeaker the right honourable John Forſter) correſpond with its outward magnificence; and the manner in which the inſide is lighted is univerſally admired. The houſe of commons is an octagon, covered with a dome ſupported by columns of the Ionic order, that riſe from an amphitheatrical gallery balluſtraded with iron ſcroll-work: this room is admirably well adapted to its purpoſe. The houſe of lords is an oblong room, ſpacious and lofty, and ornamented in a ſuperb manner: it is alſo judiciouſly adapted for the reception of the auguſt aſſembly which meet there:

there: among other decorations are two pieces of tapeſtry, repreſenting the battle of the Boyne and ſiege of Derry, allowed to have much merit. By order of both houſes of parliament, a grand new front has been lately erected on the eaſt ſide of this magnificent pile; and preparations are making to front the north and weſt ſides in a ſimilar manner, from a deſign of Mr Gandon's: thus inſulated, the whole will form a ſuit of ſenatorial apartments matchleſs in elegance and convenience.

The College founded by queen Elizabeth in 1591 is ſituated at the eaſt end of College-green. It is a moſt beautiful ſtructure, conſiſting of two ſpacious ſquares, the firſt of which contains the refectory, the old hall and chapel, and the new theatre for lectures and examinations; the front of this laſt building is finely decorated with Corinthian columns ſupporting a pediment; and over the front of the old hall, on the eaſt ſide of this ſquare, a handſome ſteeple riſes crowned with a cupola. In the other ſquare, which conſiſts partly of brick buildings for the ſtudents, there is a ſuperb library, extending through its whole length on the ſouth ſide: behind this ſquare there is a fine park. The weſt ſide of the firſt ſquare, which is built with Portland ſtone, forms the grand front, upward of 300 feet in length, ornamented with Corinthian pillars and other decorations in a very fine taſte. At a ſmall diſtance to the ſouth ſide of this front is an elegant edifice in which the provoſt reſides. The printing-office is a neat handſome ſtructure on the north ſide of the park; and oppoſite to it is the anatomy houſe, in which are to be ſeen the celebrated wax models of the human figure, executed at Paris by M. Douane, purchaſed by the right honourable the earl of Shelburne, and preſented to this univerſity. The college of Dublin is an univerſity in itſelf, conſiſting of a provoſt, vice-provoſt, 7 ſenior and 15 junior fellows, and 17 ſcholars of the houſe; the number of ſtudents is generally about 400: it has alſo profeſſors in divinity, common and civil law, phyſic, Greek, modern languages, mathematics, oriental tongues, hiſtory and oratory, modern hiſtory, natural philoſophy, anatomy and ſurgery, chemiſtry, and botany. His royal highneſs the duke of Glouceſter is chancellor, and his grace the lord primate of Ireland vice-chancellor: the viſitors are the chancellor (or, in his abſence, the vice-chancellor) and the archbiſhop of Dublin.

The Royal Exchange, ſituated on Cork-hill, was begun in 1769, and opened for buſineſs in 1779; the expence, amounting to L.40,000, being defrayed by lottery ſchemes, conducted by the merchants of Dublin with an integrity that did them honour. The building is nearly a ſquare, having three fronts of Portland ſtone in the Corinthian order, and crowned in the midſt with a fine dome, which is ſupported on the inſide by 12 Compoſite fluted pillars that form a circular walk in the centre of the ambulatory: above theſe pillars are 12 circular windows, and the cieling of the dome, which is ornamented with ſtucco, in the Moſaic ſtyle, has alſo a large window in the middle that illumines moſt of the building. Oppoſite the north entrance, in the circular walk, is a ſtatue of his preſent majeſty George III. in a Roman military habit; it is executed in bronze by Van Noſt, and elevated on a white marble pedeſtal: in a niche on the ſtair-caſe leading to the coffee-room is a white marble ſtatue of the late Dr Charles Lucas, executed by Smyth. The north front, which commands a fine view of Parliament-ſtreet and Eſſex-bridge, is embelliſhed by a range of ſix columns and their correſpondent pilaſters, ſupporting a grand pediment with a baluſtrade on each ſide: a flight of ſtone ſteps leads from the ſtreet to the entrance, which is by three fine iron-railed gates: the weſt front varies but little from the north, except in the want of a pediment, and having only three ſteps aſcending to the entrance, the ground on that ſide being nearly on a level; this front is oppoſite the eaſt end of Caſtle-ſtreet near the principal entrance to the Caſtle.

The Hoſpital for Lying-in-Women, founded by Dr Bartholomew Moſſe, and opened in 1757, ſtands on the north ſide of Great Britain ſtreet. The building is extremely light and elegant; a beautiful ſteeple riſes in the centre, and the wings are formed by ſemicircular colonnades on each ſide. Adjoining the eaſt colonnade is the Rotunda, where balls and aſſemblies are held, and concerts performed, for the benefit of the charity: cloſe to it are now erecting the grand ſuit of apartments before mentioned. The garden at the rere of the hoſpital is laid out in a good taſte.

The Blue-coat Hoſpital was founded on the weſt ſide of Queen-ſtreet by Charles II. in 1670, for educating the children of reduced freemen of the city: but the original building being greatly decayed, was taken down, and the new Blue-coat Hoſpital, ſituated in Oxmantown-green, was begun in 1773. The front is enriched by four Ionic columns, ſupporting a pediment in the centre, over which the ſteeple riſes, embelliſhed with Corinthian and Compoſite columns in an admired taſte. Connected with the front by circular walls ornamented with balluſtrades and niches, are the ſchool on one ſide and the church on the other: theſe form two well proportioned wings; they are of a ſimilar conſtruction; and each is crowned with a ſmall ſteeple or turret, correſponding with the reſt in uniform harmony and beauty.

The Barracks, the foundation of which was laid in 1704, are eſteemed the largeſt and moſt commodious in Europe. They conſiſt of four ſquares, ſituated at the weſt end of the town, on the north ſide of the river. The royal ſquare in the centre, with the horſe barrack and the little ſquare on each ſide, form a ſpacious and extenſive front to the ſouth: the palatine, now called the new ſquare, is oppoſite to Oxmantown-green; it has been lately rebuilt with hewn ſtone in a very elegant manner.

The Royal Hoſpital at Kilmainham for the ſupport of invalids of the Iriſh army was founded by king Charles II. on a plan ſimilar to that of Chelſea in England. The building was completed in 1683, and coſt upwards of L.23,500. It is ſituated at the weſt end of the town on a riſing ground near the ſouth ſide of the river, from whence there is an eaſy aſcent to it through ſeveral rows of tall trees. This edifice is of a quadrangular form, incloſing a ſpacious area handſomely laid out in graſs-plots and gravelled walks: an arcade is carried along the lower ſtory in each ſquare to the entrance of the hall and chapel, which are both curiouſly decorated; in the former are ſeveral whole-length portraits of royal perſonages and other diſtinguiſhed characters.

Dr Stevens's Hoſpital, the foundation of which was laid in 1720, is a neat quadrangular building, pleaſantly ſituated on the banks of the river near the weſt end of James's ſtreet, from whence a gravelled walk leads by a gentle deſcent to the entrance of the hoſpital, and is continued from thence to the water's edge.

The Linen-hall, at the north end of Linen-hall ſtreet, which was opened at the public expence in 1728 for the reception of linen cloths brought to the Dublin market, is a handſome building, lately enlarged with treble its number of former rooms, which furniſh a new proof of commercial proſperity.

The New Priſon in Green-ſtreet, the firſt ſtone of which was laid in 1773, is a large quadrangular ſtructure, deſigned and executed under the direction of the late Mr Cooley. The eaſt front conſiſts of a centre break of mountain ſtone ruſticated and crowned by a pediment, with a plain facade of black limeſtone on each ſide; and at the external angles of the building are four round towers.

There are many other public edifices in this city and its environs which merit particular notice. The Hoſpital for Lunatics in weſt Bow-lane, founded by Dean Swift, and opened in 1757; the Hibernian School in the Phœnix Park, and the Marine School on Sir John Rogerſon's Quay, the firſt for educating the poor children of ſoldiers, and the other for bringing up to the ſea ſervice the ſons of deceaſed or diſabled ſeamen; the Hoſpital for Incurables in ſouth Townſend-ſtreet; Mercer's Hoſpital in Stephen-ſtreet; the Meath Hoſpital on the Coombe; and Simpſon's Hoſpital in Great Britain ſtreet, the laſt of which was eſtabliſhed for the reception of blind and gouty men; are all handſome edifices conſtructed of hewn ſtone in the modern ſtyle.

To theſe public buildings may be added St Nicholas's Hoſpital in Francis-ſtreet; the Infirmary for ſick and wounded ſoldiers of the army, and the Foundling Hoſpital in James's-ſtreet; the Magdalen Aſylum in Leeſon-ſtreet; and the Houſe of Induſtry in Channel-row; the halls for corporations (particularly the Weavers Hall on the Coombe, over the entrance of which is a ſtatue of his late majeſty George II.); the Tholſel; the old Four Courts; the old Cuſtomhouſe; and ſeveral others. The Charitable Infirmary, which was firſt opened in 1728 and rebuilt in 1741, ſtood on the Inn's Quay, but has lately been pulled down, together with moſt of the houſes on that quay, where the new courts of juſtice are to be erected: and the benefits of this humane inſtitution are now diſpenſed to the public at a houſe taken for that purpoſe in Jervis-ſtreet. The new courts of juſtce, which will be a principal ornament to the metropolis, are from a deſign of Mr Gandon's, as is alſo the new Cuſtomhouſe, now nearly finiſhed on the north wall. This front extends 375 feet, enriched with arcades and columns of the Doric order, crowned with an entablature: the centre has a portico finiſhed with a pediment, in which is a bas-relief of emblematical figures alluding to commerce: over the pediment is an attic ſtory; and a magnificent dome finiſhes the centre, whereon is a pedeſtal ſupporting a ſtatue of Commerce: the key-ſtones over the entrances and in the centre of the pavilions are decorated with emblematical heads repreſenting the produce of the principal rivers of Ireland: the ſouth or front to the river, with the arms of Ireland over each pavilion, is of Portland ſtone: the whole, being formed of large and ſtriking parts, adds much to the pictureſque ſcene of the river, and will remain a laſting monument of reputation to the ſeveral artiſts employed in this ſuperb building.

The playhouſes, conſidered as public buildings, have nothing to recommend them to notice. One only, viz. the old houſe, now the theatre-royal, in Smock-alley, is kept open by Mr Daly; who, in conſequence of the bill paſſed laſt ſeſſion of parliament for the regulation of the ſtage, enjoys the excluſive privilege of managing and directing the theatrical exhibitions in this metropolis. The playhouſe in Crow-ſtreet, which formerly poſſeſſed the diſtinction of theatre-royal, has been ſhut up theſe ſeveral years paſt.

But a minute deſcription of every public edifice would occupy more room than this publication admits, not to mention the ſeveral private houſes, juſtly admired for their elegance. Among theſe are:

Leinſter-houſe, the town reſidence of his grace the Duke of Leinſter. The entrance to this princely manſion is from Kildare-ſtreet, through a grand gateway of ruſtic ſtone work, into a ſpacious court which forms a ſegment of a circle before the principal front. The inſide of this magnificent ſtructure is equal to its exterior appearance; the hall lofty and noble; and the apartments decorated and furniſhed in a ſplendid taſte, and enriched with ſeveral very valuable paintings. The garden front, plain yet bold, poſſeſſes a pleaſing ſimplicity; the garden is ſpacious and elegant, with a beautiful lawn in the centre. The whole of this building is inferior to few private edifices in the Britiſh dominions.

The Earl of Charlemont's houſe is finely ſituated in the middle of Palace-row, on an eminence exactly fronting the centre of the garden at the rere of the Lying-in-Hoſpital. The front is built with hewn ſtone brought from Arklow, ſuperior to that of Portland. The inſide of this houſe is ſuperb and convenient: the hall cieling is ſupported by columns; ſome of the apartments are decorated with a ſelect but choice collection of paintings of the beſt maſters; among which are one of Rembrandt's fineſt pictures, repreſenting Judas repenting and caſting the ſilver pieces on the ground; a portrait of Cæſar Borgia, by Titian; and the Lady's Laſt Stake by Hogarth, &c. &c. The library is eſteemed one of the fineſt apartments in Dublin, and contains a very valuable collection of the beſt authors. At one end of it is an anti-chamber, with a fine ſtatue in white marble of the Venus de Medicis by Wilton; and at the other end are two ſmall rooms, one a cabinet of pictures and antiquities, the other of medals: it is ſituated at the rere of the houſe, and connected with it by a corridore, in which are ſome handſome ſtatues and Egyptian curioſities.

Dublin, which is the ſeat of government and of the chief courts of juſtice, has received many charters and ample privileges from the kings of England ſince the reign of Henry II. who introduced the Engliſh laws into this kingdom. Richard II. erected it into a marquiſate in favour of Robert de Vere Earl of Oxford, whom he alſo created Duke of Ireland. It is an archie-

archiepiſcopal ſee, and returns with the univerſity and the county ſix members to parliament. The civil government of Dublin is executed by a lord-mayor, recorder, two ſheriffs, twenty-four aldermen, and a common council formed of repreſentatives from the twenty-five corporations. Every third year the lord-mayor, in conformity with an old charter, perambulates the bounds of the city and its liberties; and formerly the freemen of the ſeveral corporations, armed and mounted on horſeback, were accuſtomed to attend the chief magiſtrate on this occaſion, which was titled riding the franchiſes: but as this cuſtom was productive of idleneſs, intoxication, and riots, among the lower orders of the people, it has been of late years very properly laid aſide. Beſides the ſilk, woollen, and worſted manufactures carried on in that quarter of the ſuburbs called the Earl of Meath's Liberty, and which have been conſiderably improved within theſe few years, other branches of uſeful manufacture are eſtabliſhing in different parts of the metropolis; and though the trade of Dublin has heretofore conſiſted chiefly in the importation of foreign commodities, yet, now that the reſtrictions on their woollens and moſt of their other goods are removed, it is hoped the daily enlargement of their export trade will cauſe a proportionable increaſe of national opulence.

Dublin would have had a commodious ſtation for ſhipping, were it not that the harbour is choaked up with two banks of ſand, called the *North and South Bulls*, which prevent veſſels of large burden from coming over the bar. This, however, is in ſome meaſure remedied by a prodigious work of ſtone, and piles of wood extending ſome miles into the bay on the ſouth ſide, at the end of which there is a lighthouſe, beautifully conſtructed, after a deſign of the late Mr Smith's. But the port of Dublin is capable of much greater improvement; particularly by turning the courſe of the river Dodder, building a mole from the north-wall to Ringſend, and clearing the harbour, ſo as to form a grand baſon on the ſouth ſide for the reception of veſſels of all burthens. This work is to be immediately carried into execution, and will no doubt meet every poſſible encouragement, from that ſpirit for promoting the national welfare which now prevails throughout this kingdom, and is remarkably conſpicuous in the capital, where, among others, are the following public inſtitutions.

The board of truſtees for promoting the linen and hempen manufactures, eſtabliſhed by act of parliament. The Dublin ſociety, incorporated by charter in the year 1749, for improving huſbandry and other uſeful arts. The royal college of phyſicians, eſtabliſhed in the year 1679 for promoting of medical knowledge. The royal college of ſurgeons, inſtituted in the year 1785. The royal Iriſh academy, for the advancement of ſcience, polite literature, and antiquities, incorporated by letters patent the 28th of January 1786: His majeſty is patron, and the chief governor for the time being is viſitor. The Hibernian ſociety, for maintaining, educating, and apprenticing, the orphans and children of ſoldiers in Ireland. The Hibernian marine ſociety, for maintaining, educating, and apprenticing, the orphans and children of decayed ſeamen in his majeſty's navy and the merchants ſervice, alſo incorporated by royal charter.

But among theſe public inſtitutions, that of the bank of Ireland muſt not be omitted: it was eſtabliſhed by act of parliament in 1783; and by facilitating the circulation of ſpecie, gives life and vigour to manufactures and commerce. It is conducted under the management of a governor, deputy-governor, and fifteen directors choſen annually from among the ſubſcribers; with this reſtriction, that five new directors at leaſt muſt be choſen every year. This bank is kept in Mary's-abbey. There are four other banks in this city under the following firms, *viz.* Right Honourable David La Touche and Co. and Sir William Gleadowe Newcomen, Bart. and Co. both in Caſtle-ſtreet; John Dawſon Coates, Eſq; Thomas-ſtreet; and John Finlay and Co. upper Ormond-quay. The houſes in which the firſt three are kept are ſtructures worthy of notice, particularly that of Sir William Gleadowe Newcomen's, which has been rebuilt with hewn ſtone, in a good taſte, after a deſign of the late Mr Ivory's.

To theſe public inſtitutions may be added the General Poſt-Office of Ireland, eſtabliſhed by act of parliament in 1784, previous to which time the poſt-office of this kingdom was only conſidered a branch of the Engliſh one. The building erected for this purpoſe is on the ſouth ſide of College-green: it is a fine lofty extenſive ſtructure, and the offices for clerks, &c. are extremely well adapted. There are two poſtmaſters general, a ſecretary, treaſurer, accountant-general, reſident ſurveyor, and comptroller. There is alſo a penny-poſt under the direction of the ſame officers, eſtabliſhed for the conveyance of letters to all parts throughout the city and its environs.

Dublin is remarkably well ſupplied with fleſh, fowl, and fiſh, the latter in much greater perfection than any other capital in Europe. It is ſupplied with coals chiefly from Cumberland and Scotland; and water is conveyed to the city on the north ſide from the river Liffey, by machines curiouſly conſtructed for the purpoſe, at an outlet called *Iſland-bridge*: the ſouth ſide is ſupplied with that neceſſary article from a fine reſervoir or baſon, ſurrounded with a wall and a handſome graſs walk encloſed on each ſide by a thick-ſet hedge and trees planted at equal diſtances. From one end of it there is a view of the canal for the convenience of inland water carriage, now completed as far as Monaſtereven, between which and the canal harbour in James's-ſtreet, paſſage-boats ply daily; they are well appointed and accommodated with all neceſſary refreſhments. At a ſmall diſtance from the baſon there is a bridge of a ſingle arch thrown over the canal, the elegance and architecture of which are much admired: the ſides of the canal for ſome miles into the country are planted with elm-trees, which renders its banks in fair weather a delightful place of exerciſe for the citizens; who alſo reſort for recreation to his majeſty's Phœnix-park, a fine extenſive encloſure at the weſt end of the town and on the oppoſite ſide of the river to the canal, diverſified with woodland, campaign, and riſing ground, and well ſtocked with deer. It is ſeven miles in circuit; and beſides the Hibernian ſchool, is adorned with the viceroy's beautiful villa and ſome handſome lodges belonging to the rangers: in this park are alſo a magazine for powder and a battery that commands the city. In 1747, a fluted pillar 30 feet high, with a phœnix on the top, was erected in the centre of a ring in this park by the celebrated earl of Cheſterfield when lord lieutenant of Ireland.

The circular road which ſurrounds the city, beginning on one ſide of the river, at the eaſt end of the town, and terminating on the oppoſite ſhore, is carried through the park. This road forms a very agreeable ride, and is much frequented. It is the boundary of the juriſdiction of the new police, inſtituted for the better preſervation of the peace and good order of the city and the perſonal ſecurity of its inhabitants. This inſtitution, lately eſtabliſhed by act of parliament, is under the direction of a chief commiſſioner, three aſſiſtant commiſſioners, and four diviſional juſtices, who are all aldermen of the city: which is therefore properly termed *the diſtrict of the metropolis*, and divided into four wards. The police-guard conſiſts of 40 horſemen and 400 foot, well armed, and in regular uniform: they are taught military diſcipline, and ſtationed at night-time in the ſeveral watch-houſes; from whence parties are conſtantly patrolling the ſtreets, and centinels are placed at different ſtands. This inſtitution is found by experience to be a much more effectual prevention of robberies, riots, and nocturnal outrages, than the pariſh watches; and to this ſecurity which the well diſpoſed working manufacturers enjoy, may in a great meaſure be attributed that encreaſing ſpirit of induſtry and peaceable behaviour now ſo prevalent among this uſeful claſs of the community, which cannot fail to be productive of the moſt ſalutary conſequences to the future welfare of the metropolis and the kingdom in general.

DUBOS (John Baptiſt), a learned and ingenious French author, born at Beauvais in 1670. He finiſhed his ſtudies at Paris, and at length was intruſted with the management of ſeveral important affairs in Italy, England, and Holland. At his return to Paris, he had a prebendary given him; afterwards he had a penſion of two thouſand livres, and the abbey of Notre Dame at Reſſons, near Beauvais. He died at Paris, when perpetual ſecretary of the French academy, on the 23d of March 1742. His principal works are, 1. Critical Reflections on Poetry and Painting, in three volumes duodecimo. 2. A Critical Hiſtory of the French Monarchy in Gaul, two volumes 4to.

DUBRIS (anc. geog.), a town of Britain; now *Dover*, from the *Dovoria* of the lower age. A port town of Kent, oppoſite to Calais.

DUCAL, in general, ſomething belonging to a duke. See Duke.

The letters patent granted by the ſenate of Venice are called *ducals:* ſo alſo are the letters wrote, in the name of the ſenate, to foreign princes. The denomination of ducal is derived hence; that, at the beginning of ſuch patents, the name of the duke or doge is wrote in capitals, thus, *N— Dei Gratia Dux Venetiarum*, &c. The date of ducals is uſually in Latin, but the body is in Italian. A courier was diſpatched with a ducal to the emperor, returning him thanks for renewing the treaty of alliance (in 1716), againſt the Turks, with the republic of Venice.

DUCAS, a learned Greek, who wrote an hiſtory of what paſſed under the laſt emperors of Conſtantinople, till the ruin of that city. This work, which is eſteemed, was printed at the Louvre in 1649, with the Latin tranſlation and notes of Bouillaud.

DUCAT, a foreign coin, either of gold or ſilver, ſtruck in the dominions of a duke; being about the ſame value with a Spaniſh piece of eight, or a French crown, or four ſhillings and ſixpence ſterling when of ſilver; and twice as much when of gold. See Coin.

The origin of ducats is referred to one Longinus, governor of Italy; who, revolting againſt the emperor Juſtin the Younger, made himſelf duke of Ravenna, and called himſelf *Exarcha*, i. e. *without lord or ruler;* and, to ſhow his independence, ſtruck pieces of money of very pure gold in his own name, and with his own ſtamp, which were called *ducati, ducats;* as Procopius relates the ſtory.

After him, the firſt who ſtruck ducats were the Venetians, who called them *Zecchini* or *ſequins*, from Zecca, the place where they firſt were ſtruck. This was about the year 1280, in the time of John Danduli: but we have pretty good evidence, that Roger king of Sicily had coined ducats as early as 1240. And Du Cange ſcruples not to affirm, that the firſt ducats were ſtruck in the duchy of Apulia in Calabria. The chief gold ducats now current are, the ſingle and double ducats of Venice, Florence, Genoa, Germany, Hungary, Poland, Sweden, Denmark, Flanders, Holland, and Zurich. The heavieſt of them weighs 5 pennyweights 17 grains, and the lighteſt 5 pennyweights 10 grains; which is to be underſtood of the double ducats, and of the ſingle in proportion.

The Spaniards have no ducats of gold; but, in lieu thereof, they make uſe of the ſilver one; which, with them, is no real ſpecies, but only a money of account like our pound. It is equivalent to 11 rials. See Rial. The ſilver ducats of Florence ſerve there for crowns.

DUCATOON, a ſilver coin, ſtruck chiefly in Italy; particularly at Milan, Venice, Florence, Genoa, Lucca, Mantua, and Parma: though there are alſo Dutch and Flemiſh ducatoons. They are all nearly on the ſame footing; and being a little both finer and heavier than the piece of eight, are valued at two pence or three pence more, viz. at about four ſhillings and eightpence ſterling.

There is alſo a gold ducatoon, ſtruck and current chiefly in Holland: it is equivalent to twenty florins, on the footing of one ſhilling and eleven pence halfpenny the florin.

DUCENARIUS, in antiquity, an officer in the Roman army, who had the command of 200 men.

The emperors had alſo ducenarii among their procurators or intendants, called *procuratores ducenarii*. Some ſay, that theſe were ſuch whoſe ſalary was two hundred ſeſterces; as in the games of the circus, horſes hired for two hundred ſeſterces were called *ducenarii*. Others hold, that ducenarii were thoſe who levied the two hundredth penny, the officers appointed to inſpect the raiſing of that tribute. In the inſcription at Palmyra, the word *ducenarius*, in Greek δυκιναριος, occurs very often.

DUCENTESIMA, in antiquity, a tax of the two hundredth penny, exacted by the Romans.

DUCHAL (James), D. D. a late pious and learned diſſenting miniſter, was born in Ireland, and finiſhed his ſtudies at the univerſity of Glaſgow; which afterwards, from a regard to his merit, conferred on him the degree of doctor of divinity. He reſided 10 or 11 years at Cambridge, as the paſtor of a ſmall congregation there; where he enjoyed his beloved retirement, the advantage of books and of learned converſation, which he improved with the greateſt diligence. On Mr Abernethy's removal from Antrim, he ſucceeded him there; and on that gentleman's death, he ſucceeded him as miniſter of the diſſenting meeting-houſe in Wood-ſtreet, Dublin. In this ſituation he continued till his death, which happened on the 4th of May 1761, when he had completed his 64th year. He publiſhed a volume of excellent diſcourſes on the preſumptive arguments in favour of the Chriſtian religion, and many occaſional tracts; and after his death were publiſhed a number of his ſermons, in three volumes 8vo.

DUCHY, in geography, an appellation given to the dominions of a duke.

*Duchy Court*, a court wherein all matters belonging to the duchy or county palatine of Lancaſter are decided by decree of the chancellor of that court.

The origin of this court was in Henry the IV.'s time, who obtained the crown by depoſition of Richard II. and having the duchy of Lancaſter, by deſcent, in right of his mother, became ſeiſed thereof as king, not as duke: So that all the liberties, franchiſes, and juriſdictions of the ſaid county paſſed from the king, by his great ſeal, and not by livery or attornment, as the earldom of March, and other poſſeſſions, which deſcended to him by other anceſtors than the king's did. Henry IV. by authority of parliament, ſevered the poſſeſſions, liberties, &c. of the ſaid duchy from the crown: but Edward IV. reſtored them to their former nature.

The officers belonging to this court are, a chancellor, attorney-general, receiver-general, clerk of the court, and meſſenger; beſide the aſſiſtants, as an attorney in the exchequer, another in chancery, and four counſellors.

DUCK, in ornithology. See Anas and Decoy.

This fowl is furniſhed with a peculiar ſtructure of veſſels about the heart, which enables it to live a conſiderable time under water, as is neceſſary for it in diving. This made Mr Boyle think it a more proper ſubject for experiments with the air-pump than any other bird. A full grown duck being put into the receiver of an air-pump, of which ſhe filled one third part, and the air exhauſted, the creature ſeemed to bear it better for the firſt moments that a hen or other ſuch fowl; but, after about a minute, ſhe ſhowed great ſigns of uneaſineſs, and in leſs than two minutes her head fell down, and ſhe appeared dying, till revived by the letting in of the air. Thus, whatever facility of diving this and other water-fowl may have, it does not appear that they can ſubſiſt, without air for reſpiration, any longer than other animals. A young callow duck was afterwards tried in the ſame manner, and with the ſame ſucceſs, being reduced very near death in leſs than two minutes. But it is obſervable, that both birds ſwelled very much on pumping out the air, ſo that they appeared greatly larger to the ſpectators, eſpecially about the crop; it not being intended that any water-fowl ſhould live in an exceedingly rarefied air, but only be able to continue occaſionally ſome time under water. Nature, though ſhe has provided them with the means of this, has done nothing for them in regard to the other.

The ſtrongeſt inſtance of theſe creatures being calculated to live almoſt in any ſituation, we have in the accounts of the blind ducks in the Zirchnitzer lake in Carniola. It is ſuppoſed that this lake communicates with another lake under ground in the mountain Savornic, and fills or empties itſelf according to the fulneſs or emptineſs of that lake; the water of the upper lake running off, and that in vaſt quantities, by holes in the bottom. The ducks, which are here always in great numbers, are often carried down along with the water, and forced into the ſubterraneous lake to which it retires. In this unnatural habitation, many of theſe creatures undoubtedly periſh, but ſome remain alive. Theſe become blind, and loſe all their feathers; and in the next filling of the lake, both they and vaſt numbers of fiſh are thrown up with the water. At this time they are fat, but make a ſtrange appearance in their naked ſtate, and are eaſily caught, by reaſon of their want of ſight. In about a fortnight they recover their ſight and feathers; and are then of the ſize of a common wild-duck, but of a black colour, with a white ſpot in their forehead. When opened, on being taken at their firſt coming up in their blind ſtate, their ſtomachs are found full of ſmall fiſhes, and ſomewhat reſembling weeds. From this it ſeems, that they cannot be abſolutely blind; but that the degree of light to which they have been accuſtomed in their ſubterraneous habitation, was ſufficient to enable them to procure food for themſelves; and their blindneſs, on coming again into open day-light, is no other than that of a man who has been long in the dark, on having in an inſtant a large blaze of candles ſet under his eyes.

Duck (Stephen), originally a threſher in a barn, was born about the beginning of the preſent century. By his poetical talents he firſt attracted the notice of ſome gentlemen at Oxford; and being recommended to Queen Caroline, he, under her patronage, took orders, and was preferred to the living of Byfleet in Surry. His abilities were, however, much more conſpicuous in his primitive ſtation than in his advancement; though, it is ſaid, he was not diſliked as a preacher. Falling at length into a low-ſpirited melancholy way, probably owing to his change of life and ceſſation from his uſual labour, he in a fit of lunacy flung himſelf into the Thames, in 1756.

DUCKING, plunging in water, a diverſion anciently practiſed among the Goths by way of exerciſe; but among the Celtæ, Franks, and ancient Germans, it was a ſort of puniſhment for perſons of ſcandalous lives.—At Marſeilles and Bourbon their men and women of ſcandalous life are condemned to the cale, as they call it; that is, to be ſhut up naked to the ſhift in an iron cage faſtened to the yard of a ſhallop, and ducked ſeveral times in the river. The ſame is done at Thoulouſe to blaſphemers.

Ducking, a ſort of marine puniſhment, inflicted by the French, on thoſe who have been convicted of deſertion, blaſphemy, or exciting ſedition. It is performed as follows: The criminal is placed aſtride of a ſhort thick batten, faſtened to the end of a rope, which paſſes through a block hanging at one of the yard-arms. Thus fixed, he is hoiſted ſuddenly up to the yard, and the rope being ſlackened at once, he is plunged into the ſea. This chaſtiſement is repeated ſeveral times conformable to the purport of the ſentence pronounced againſt the culprit, who has at that time ſeveral cannon-ſhot faſtened to his feet during the puniſhment;

which is rendered public by the firing of a gun, to advertiſe the other ſhips of the fleet thereof, that their crews may become ſpectators.

DUCKING is alſo a penalty which veteran ſailors pretend to inflict on thoſe who, for the firſt time, paſs the tropic of Cancer, the equator, or the ſtraits of Gibraltar, in conſequence of their refuſal or incapacity to pay the uſual fine levied on this occaſion.

*Ducking-Stool.* See CASTIGATORY.

DUCKUP, at ſea, is a term uſed by the ſteer'sman, when the main-ſail, fore-ſail, or ſprit-ſail, hinders his ſeeing to ſteer by a land-mark: upon which he calls out, *Duckup the clew-lines of theſe ſails;* that is, hale the ſails out of the way. Alſo when a ſhot is made by a chace-piece, if the clew of the ſprit-ſail hinders the ſight, they call out, *Duckup*, &c.

DUCT, in general, denotes any tube or canal. It is a term much uſed by anatomiſts.

DUCTILITY, in phyſics, a property poſſeſſed by certain ſolid bodies, which conſiſts in their yielding to percuſſion or preſſure, and in receiving different forms without breaking.

Some bodies are ductile both when they are hot and when they are cold, and in all circumſtances. Such are metals, particularly gold and ſilver. Other bodies are ductile only when heated to a ſufficient degree; ſuch as wax and other ſubſtances of that kind, and glaſs. Other bodies, particularly ſome kinds of iron, called by the workmen *red-ſhort*, braſs, and ſome other metallic mixtures, are ductile only when cold, and brittle when hot. The degrees of heat requiſite to produce ductility in bodies of the firſt kind, vary according to their different natures. In general, the heat of the body muſt be ſuch as is ſufficient to reduce it to a middle ſtate betwixt ſolidity and perfect fuſion. As wax, for inſtance, is fuſible with a very ſmall heat, it may be rendered ductile by a ſtill ſmaller one; and glaſs, which requires a moſt violent heat for its perfect fuſion, cannot acquire its greateſt ductility until it is made perfectly red-hot, and almoſt ready to fuſe. Laſtly, ſome bodies are made ductile by the abſorption of a fluid. Such are certain earths, particularly clay. When theſe earths have abſorbed a ſufficient quantity of water to bring them into a middle ſtate betwixt ſolidity and fluidity, that is to the conſiſtence of a conſiderably firm paſte, they have then acquired their greateſt ductility. Water has preciſely the ſame effect upon them in this reſpect that fire has upon the bodies above mentioned.

DUDLEY (Edmund), an eminent lawyer and able ſtateſman in the reign of Henry VII.; who with Sir Richard Empſon, another lawyer of the ſame complexion, aſſiſted in filling that rapacious monarch's coffers by arbitrary proſecutions of the people on old penal ſtatutes. They were beheaded on the acceſſion of Henry VIII. to pacify the clamours of the people for juſtice.

DUDLEY (John), duke of Northumberland, ſon of the above, a ſtateſman; memorable in the Engliſh hiſtory for his unſucceſsful attempt to place the crown on the head of his daughter-in-law, lady Jane Grey, who fell a victim to his ambition; was born in 1502, and beheaded in 1553. See *(Hiſtory of)* ENGLAND. Ambroſe his eldeſt ſon was a brave general and able ſtateſman under queen Elizabeth; and received the appellation of *the good earl of Warwick*. Henry, the duke's ſecond ſon, was killed at the ſiege of St Quintin. Robert, the third ſon, a man of bad character, was created earl of Leiceſter; and was one of queen Elizabeth's favourites. His fourth ſon was the unfortunate lord Guildford Dudley, whoſe only crime was his being the huſband of lady Jane Grey, for which he was beheaded in 1554.

DUDLEY (Sir Robert), as he was called in England, and, as he was ſtyled abroad, *earl of Warwick and duke of Northumberland*, was the ſon of Robert above mentioned, by the lady Douglas Sheffield; and was born at Sheen in Surry in 1573, where he was carefully concealed, to prevent the queen's knowledge of the earl's engagements with his mother. He ſtudied at Oxford; when his father dying, left him the bulk of his eſtate. He was at this time one of the fineſt gentlemen in England; and having a particular turn to navigation, fitted out a ſmall ſquadron at his own expence, with which he ſailed to the river Oroonoque, and took and deſtroyed nine ſail of Spaniſh ſhips. In 1595, he attended the earl of Eſſex, and the lord high admiral of England, in their expedition againſt the Spaniards; when, for his gallant behaviour at the taking of Cadiz, he received the honour of knighthood. He now endeavoured to prove the legitimacy of his birth, in order to be intitled to his hereditary honours. But being overpowered by the intereſt of the counteſs dowager of Leiceſter, he applied for a licence to travel; and being well received at the court of Florence, reſolved to continue there, notwithſtanding his receiving a letter of recal; on which his whole eſtate was ſeized by king James I. and veſted in the crown. He diſcovered at the court of Coſmo II. great duke of Tuſcany, thoſe great abilities for which he had been admired in England, and was at length made chamberlain to his ſerene highneſs's conſort. He there contrived ſeveral methods of improving ſhipping; introduced new manufactures; and by other ſervices obtained ſo high a reputation, that at the deſire of the archducheſs, the emperor Ferdinand, in 1620, created him a duke of the holy Roman empire. He afterwards drained a vaſt tract of moraſs between Piſa and the ſea; and raiſed Leghorn, which was then a mean, pitiful place, into a large and beautiful town, improving the haven by a mole, which rendered it both ſafe and commodious; and having engaged his highneſs to declare it a free port, he, by his influence and correſpondence, drew many Engliſh merchants to ſettle and ſet up houſes there, which was of very great ſervice to his native country, as well as to the Spaniards. He was alſo the patron of learned men, and held a high place himſelf in the republic of letters. His moſt celebrated work is his *Del Arcano del Mare*, in two volumes, folio.

DUEL, a ſingle combat, at a time and place appointed, in conſequence of a challenge. This cuſtom came originally from the northern nations, among whom it was uſual to decide all their controverſies by arms. Both the accuſer and accuſed gave pledges to the judges on their reſpective behalf; and the cuſtom prevailed ſo far amongſt the Germans, Danes, and Franks, that none were excuſed from it but women, ſick people, cripples, and ſuch as were under 21 years of age or above 60. Even eccleſiaſtics, prieſts, and monks, were obliged to find champions to fight in their ſtead. The puniſhment of the vanquiſhed was either death, by hanging or beheading; or, mutilation of members, according to the circumſtances of the caſe. Duels were at firſt admitted not only on criminal occaſions, but on ſome civil ones for the maintenance of rights to eſtates, and the like: in latter times, however, before they were entirely aboliſhed, they were reſtrained to theſe four caſes. 1 That the crime ſhould be capital. 2. That it ſhould be certain the crime was perpetrated. 3. The accuſed muſt by common fame be ſuppoſed guilty. And, 4. The matter not capable of proof by witneſſes.

DUEL, at preſent, is uſed for ſingle combat on ſome private quarrel; and muſt be premeditated, otherwiſe it is called a *rencounter*. If a perſon is killed in a duel, both the principals and ſeconds are guilty, whether the ſeconds engage or not. (See the article MURDER.) It is alſo a very high offence to challenge a perſon either by word or letter, or to be the meſſenger of a challenge, (See LAW, n° clxxxv. 20.)

The general practice of duelling, in this laſt ſenſe, took its riſe in the year 1527, at the breaking up of a treaty between the emperor Charles V. and Francis I. The former deſired Francis's herald to acquaint his ſovereign, that he would henceforth conſider him not only as a baſe violator of public faith, but as a ſtranger to the honour and integrity becoming a gentleman. Francis, too high-ſpirited to bear ſuch an imputation, had recourſe to an uncommon expedient to vindicate his character. He inſtantly ſent back the herald with a cartel of defiance, in which he gave the emperor the lie in form, challenged him to ſingle combat, requiring him to name the time and place of the encounter, and the weapons with which he choſe to fight. Charles, as he was not inferior to his rival in ſpirit or bravery, readily accepted the challenge; but after ſeveral meſſages concerning the arrangement of all the circumſtances relative to the combat, accompanied with mutual reproaches bordering on the moſt indecent ſcurrility, all thoughts of this duel, more becoming the heroes of romance than the two greateſt monarchs of their age, were entirely laid aſide.

The example of two perſonages ſo illuſtrious, drew ſuch general attention, and carried with it ſo much authority, that it had conſiderable influence in introducing an important change in manners all over Europe. Duels, as has already been obſerved, had been long permitted by the laws of all the European nations; and, forming a part of their juriſprudence, were authoriſed by the magiſtrate on many occaſions, as the moſt proper method of terminating queſtions with regard to property, or of deciding in thoſe which regarded crimes. But ſingle combats being conſidered as ſolemn appeals to the omniſcience and juſtice of the Supreme Being, they were allowed only in public cauſes, according to the preſcription of law, and carried on in a judicial form*. Men, accuſtomed to this manner of deciſion in courts of juſtice, were naturally led to apply it to perſonal and private quarrels. Duels, which at firſt could be appointed by the civil judge alone, were fought without the interpoſition of his authority, and in caſes to which the laws did not extend. The tranſaction between Charles and Francis ſtrongly countenanced this practice. Upon every affront or injury which ſeemed to touch his honour, a gentleman thought himſelf intitled to draw his ſword, and to call on his adverſary to make reparation. Such an opinion, introduced among men of fierce courage, of high ſpirit, and of rude manners, where offence was often given, and revenge was always prompt, produced moſt fatal conſequences. Much of the beſt blood in Chriſtendom was ſhed; many uſeful lives were loſt; and, at ſome periods, war itſelf hath hardly been more deſtructive than theſe conteſts of honour. So powerful, however, is the dominion of faſhion, that neither the terror of penal laws, nor reverence for religion, have been able entirely to aboliſh a practice unknown among the ancients, and not juſtifiable by any principle of reaſon; though at the ſame time we muſt aſcribe, in ſome degree, the extraordinary gentleneſs and complaiſance of modern manners, and that reſpectful attention of one man to another, which at preſent render the ſocial intercourſes of life far more agreeable and decent than among the moſt civilized nations of antiquity.

Public opinion is not eaſily controlled by civil inſtitutions; for which reaſon it may be queſtioned whether any regulations can be contrived of ſufficient force to ſuppreſs or change the rule of honour which ſtigmatizes all ſcruples about duelling with the reproach of cowardice.

The inadequate redreſs which the law of the land affords for thoſe injuries which chiefly affect a man in his ſenſibility and reputation, tempts many to redreſs themſelves. Proſecutions for ſuch offences, by the trifling damages that are recovered, ſerve only to make the ſufferer more ridiculous.—This ought to be remedied.

For the army, where the point of honour is cultivated with exquiſite attention and refinement, there might be eſtabliſhed a court of honour, with a power of awarding thoſe ſubmiſſions and acknowledgments which it is generally the object of a challenge to obtain; and it might grow into a faſhion with perſons of rank of all profeſſions to refer their quarrels to the ſame tribunal.

Duelling, as the law now ſtands, can ſeldom be overtaken by legal puniſhment. The challenge, appointment, and other previous circumſtances, which indicate the intention with which the combatants met, being ſuppreſſed, nothing appears to a court of juſtice but the actual rencounter; and if a perſon be ſlain when actually fighting with his adverſary, the law deems his death nothing more than manſlaughter.

DUERO, or DURO, a large river, which, riſing in Old Caſtile in Spain, runs from eaſt to weſt, croſſes the province of Leon, and after dividing Portugal from Spain by a ſoutherly courſe, turns weſtward, croſſes Portugal, and falls into the Atlantic Ocean at Porto-Port.

DUGDALE (Sir William), an eminent Engliſh hiſtorian, antiquarian, and herald, born in Warwickſhire in 1605. He was introduced into the herald's office by Sir Chriſtopher Hatton; and aſcended gradually through all the degrees, until he became garter principal king at arms. His chief work is the *Monaſticon Anglicanum*, in three vols folio; containing the charters and deſcriptions of all the Engliſh monaſteries, adorned with engravings: in the former part of which work he was aſſiſted by Mr Roger Dodſworth. Nor are his Antiquities of Warwickſhire leſs eſteemed. He wrote likewiſe, among other things of leſs note, the Hiſtory of St Paul's Cathedral; a Hiſtory of Embanking and Draining; a Baronage of England; and completed the ſecond volume of Sir Henry Spelman's Councils, with a ſecond part of his Gloſſary. He died in 1686. His ſon, Sir John, was Norroy king at arms, and publiſhed a Catalogue of Engliſh Nobility. His daughter Elizabeth married the famous Elias Aſhmole.

DUILLIA LEX, was enacted by M. Duillius, a tribune, in the year of Rome 304. It made it a capital crime to leave the Roman people without its tribunes, or to create any new magiſtrate without a ſufficient cauſe. Another in 392, to regulate what intereſt ought to be paid for money lent.

C. DUILLIUS NEPOS, a Roman conſul, the firſt who obtained a victory over the naval power of Carthage in the year of Rome 492. He took fifty of the enemy's ſhips, and was honoured with a naval triumph, the firſt that ever appeared at Rome. The ſenate rewarded his valour by permitting him to have muſic playing and torches lighted at the public expence every day while he was at ſupper. There were ſome medals ſtruck in commemoration of this victory; and there exiſts a column at Rome which was erected on the occaſion.

DUKE, Dux, a ſovereign prince, without the title or quality of king. Such are the Duke of Lorrain, of Holſtein, Savoy, of Parma, &c. The word is borrowed from the modern Greeks, who call *doucas* what the Latins call *dux*.

There are alſo two ſovereigns who bear the title of *grand-duke;* as the grand-duke of Tuſcany, and the grand-duke of Muſcovy, now called the *czar* or emperor of Ruſſia. The title of *great duke* belongs to the apparent heir of Ruſſia; and the title of *arch-duke* is given to all the ſons of the houſe of Auſtria, as that of *arch-ducheſs* to all the daughters.

DUKE, *Dux*, is alſo a title of honour or nobility, the next below princes.

The dukedom or dignity of duke is a Roman dignity, denominated *a ducendo*, "leading" or "commanding." Accordingly, the firſt dukes, *duces*, were the *ductores exercituum*, "commanders of armies." Under the late emperors, the governors of provinces in war-time were intitled *duces*. In after times the ſame denomination was alſo given to the governors of provinces in time of peace. The firſt governor under the name of *duke* was a duke of the Marchia Rhætica, or Griſons, whereof mention is made in Caſſiodorus; and there were afterwards thirteen dukes in the eaſtern empire, and twelve in the weſtern. The Goths and Vandals, upon their over-running the provinces of the weſtern empire, aboliſhed the Roman dignities wherever they ſettled. But the Franks, &c. to pleaſe the Gauls, who had long been uſed to that form of government, made it a point of politics not to change any thing therein: and accordingly they divided all Gaul into duchies and counties; and gave the names ſometimes of dukes, and ſometimes of counts, *comites*, to the governors thereof.

In England, during the Saxons time, Camden obſerves, the officers and commanders of armies were called dukes, *duces*, after the ancient Roman manner, without any addition. After the Conqueror came in, the title lay dormant till the reign of Edward III. who created his ſon Edward, firſt called the *Black Prince*, duke of Cornwall; which hath ever ſince been the peculiar inheritance of the king's eldeſt ſon during the life of his father; ſo that he is *dux natus, non creatus*. After whom there were more made, in ſuch manner as that their titles deſcended to their poſterity. They were created with much ſolemnity, *per cincturam gladii, cappæque, & circuli aurei in capite impoſitionem*. However, in the reign of Queen Elizabeth, A. D. 1572, the whole order became utterly extinct; but it was revived about 50 years afterwards by her ſucceſſor, in the perſon of George Villiers duke of Buckingham.

Though the French retained the names and form of the ducal government, yet under their ſecond race of kings there were ſcarce any ſuch thing as dukes: but all the great lords were called *counts*, *peers*, or *barons;* excepting, however, the dukes of Burgundy and Aquitain; and the duke of France, which was a dignity Hugh Capet himſelf held, correſponding to the modern dignity of maire de palais, or the king's lieutenant. By the weakneſs of the kings, the dukes or governors ſometimes made themſelves ſovereigns of the provinces truſted to their adminiſtration. This change happened chiefly about the time of Hugh Capet; when the great lords began to diſmember the kingdom, ſo that that prince found more competitors among them than ſubjects. It was even with a great deal of difficulty they could be brought to own him their ſuperior, or to hold of him by faith and homage. By degrees, what with force, and what by marriages, theſe provinces, both duchies and counties, which had been rent from the crown, were again united to it. But the title *duke* was no longer given to the governors of provinces. From that time duke became a mere title of dignity, annexed to a perſon and his heirs male, without giving him any domain, territory, or juriſdiction over the place whereof he was duke. All the advantages thereof now conſiſt in the name, and the precedence it gives.

The dukes of our days retain nothing of their ancient ſplendor but the coronet on their eſcutcheon, which is the only mark of their departed ſovereignty. They are created by patent, cincture of the ſword, mantle of ſtate, impoſition of a cape, and coronet of gold on the head, and a verge of gold in their hand.

The eldeſt ſons of dukes are by the courteſy of England ſtyled *marquiſſes*, though they are uſually diſtinguiſhed by their father's ſecond title, whether it be that of marquis or earl; and the younger ſons *lords*, with the addition of their Chriſtian name, as Lord James, Lord Thomas, &c. and they take place of viſcounts, though not ſo privileged by the laws of the land.

A duke has the title of *grace;* and being writ to, he is ſtyled, in the heralds language, *moſt high, potent, and noble prince*. Dukes of the blood royal are ſtyled *moſt high, moſt mighty, and illuſtrious princes*.

DUKE, among Hebrew grammarians, is an appellation given to a ſpecies of accents anſwering to our comma. See ACCENT.

*Duke-Duke*, a quality given in Spain to a grandee of the houſe of Sylva, on account of his having ſeveral duchies from the uniting of two conſiderable houſes in his perſon. Don Roderigo de Sylva, eldeſt ſon of Don

Ruy Gomez de Sylva, and heir of his duchies and principalities, married the eldeſt daughter of the Duke de l'Infantado; in virtue of which marriage, the preſent Duke de Paſtrana, who is deſcended therefrom, and is grandſon of Don Roderigo de Sylva, has added to his other great titles that of duke-duke, to diſtinguiſh himſelf from the other dukes; ſome whereof may enjoy ſeveral duchies, but none ſo conſiderable ones, nor the titles of ſuch eminent families.

DULCIFYING, in chemiſtry, is the ſweetening any matter impregnated with ſalts, by frequently waſhing it in pure water.

DULL, in the manege. The marks of a dull horſe, called by the French *marquis de ladre*, are white ſpots round the eye and on the tip of the noſe, upon any general colour whatſoever. Though the vulgar take theſe ſpots for ſigns of ſtupidity, it is certain they are great marks of the goodneſs of a horſe; and the horſes that have them are very ſenſible and quick upon the ſpur.

DULLART (Heiman), a Dutch painter and poet. He was a pupil to Rembrandt, for whoſe works the few he left are often miſtaken. He died in 1684.

DUMBARTON. See DUNBARTON.

DUMBNESS, the privation of the faculty of ſpeech. The moſt general, or rather the ſole cauſe of dumbneſs, is the want of the ſenſe of hearing. The uſe of language is originally acquired by imitating articulate ſounds. From this ſource of intelligence, deaf people are entirely excluded: they cannot acquire articulate ſounds by the ear: unleſs, therefore, articulation be communicated to them by ſome other medium, theſe unhappy people muſt for ever be deprived of the uſe of language; and as language is the principal ſource of knowledge, whoever has the misfortune to want the ſenſe of hearing, muſt remain in a ſtate little ſuperior to that of the brute creation. Deafneſs has in all ages been conſidered as ſuch a total obſtruction to ſpeech or written language, that an attempt to teach the deaf to ſpeak or read has been uniformly regarded as impracticable, till Dr Wallis and ſome others have of late ſhown, that although deaf people cannot learn to ſpeak or read by the direction of the ear, there are other ſources of imitation, by which the ſame effect may be produced. The organs of hearing and of ſpeech have little or no connection. Perſons deprived of the former generally poſſeſs the latter in ſuch perfection, that nothing further is neceſſary, in order to make them articulate, than to teach them how to uſe theſe organs. This indeed is no eaſy taſk; but experience ſhows that it is practicable. Mr THOMAS BRAIDWOOD, late of Edinburgh, was perhaps the firſt who ever brought this ſurpriſing art to any degree of perfection. He began with a ſingle pupil in 1764; and ſince that period has taught great numbers of people born deaf to ſpeak diſtinctly; to read, to write, to underſtand figures, the principles of religion and morality, &c. At the time we firſt converſed with him, being a few years after the commencement of his practice, he had a conſiderable number of deaf pupils, ſome of them above 20 years of age, all making a rapid and amazing progreſs in thoſe uſeful branches of education.

Mr Braidwood's principal difficulty, after he had diſcovered this art, was to make people believe in the practicability of it. He advertiſed in the public papers; he exhibited his pupils to many noblemen and gentlemen; ſtill he found the generality of mankind unwilling to believe him. A remarkable inſtance of this incredulity occurred ſome years ago. A gentleman in England ſent a deaf girl of his to Mr Braidwood's care. A year or two afterwards, Mr Braidwood wrote to the father, that his daughter could ſpeak, read, and write diſtinctly. The father returned an anſwer, begging Mr Braidwood's excuſe, as he could not believe it; however, he deſired a friend of his, who was occaſionally going to Edinburgh, to call at Mr Braidwood, and inquire into the truth of what he had wrote him: he did ſo; converſed with Mr Braidwood, ſaw the young lady, heard her read, ſpeak, and anſwer any queſtions he put to her. On his return, he told the father the ſurpriſing progreſs his child had made; but ſtill the father thought the whole an impoſition: the girl herſelf wrote to her father, but he looked upon the letter as a forgery. About this time the father died; and the mother ſent an uncle and couſin of the deaf lady's from Shrewſbury, in order to be ſatisfied of the truth. When they arrived, Mr Braidwood told the girl her uncle and couſin were in the parlour; and deſired her to go and aſk them how they did, and how her mother and other friends did. The friends were aſtoniſhed, and could hardly credit their own ears and eyes.

When we converſed with Mr Braidwood concerning the nature and method of teaching this wonderful art, he ſeemed to be very deſirous of communicating and tranſmitting his diſcovery to poſterity; but obſerved, from the nature of the thing we believe it to be true, that he could not communicate it ſo fully in writing as to enable any other perſon to teach it. The firſt thing in the method is, to teach the pupil to pronounce the ſimple ſounds of the vowels and conſonants. We have even ſeen him performing this operation; but are unable to give a clear idea of it. He pronounces the ſound of *a* ſlowly, pointing out the figure of the letter at the ſame time; makes his pupil obſerve the motion of his mouth and throat; he then puts his finger into the pupil's mouth, depreſſes or elevates the tongue, and makes him keep the parts in that poſition; then he lays hold of the outſide of the windpipe, and gives it ſome kind of ſqueeze, which it is impoſſible to deſcribe: all the while he is pronouncing *a*, the pupil is anxiouſly imitating him, but at firſt ſeems not to underſtand what he would have him to do. In this manner he proceeds, till the pupil has learned to pronounce the ſounds of the letters. He goes on in the ſame manner to join a vowel and a conſonant, till at length the pupil is enabled both to ſpeak and read.

That his pupils were taught not only the mere *pronunciation*, but alſo to underſtand the *meaning* of what they read, was eaſily aſcertained by a converſation with any of them. Of this Mr Pennant gives a remarkable inſtance in a young lady of about 13 years of age, who had been ſome time under the care of Mr Braidwood. "She readily apprehended (ſays he) all I ſaid, and returned me anſwers with the utmoſt facility. She read; ſhe wrote well. Her reading was not by rote. She could clothe the ſame thoughts in a new ſet of words, and never vary from the original ſenſe. I have forgot the book ſhe took up, or the ſentences ſhe made a new verſion of: but the effect was as follows:

"*Original paſſage.* Lord Bacon has divided the whole of human knowledge into hiſtory, poetry, and philoſophy; which are referred to the three powers of the mind, memory, imagination, and reaſon.

"*Verſion.* A nobleman has parted the total or all of man's ſtudy or underſtanding into, An account of the life, manners, religion or cuſtoms of any people or country; verſe or metre; moral or natural knowledge: which are pointed to the three faculties of the ſoul or ſpirit; the faculty of remembering what is paſt, thought or conception, and right judgment."

Mr Braidwood's ſucceſs ſince he went to ſettle in London is univerſally known. Several other perſons have ſince attempted the ſame art with various degrees of ability. But a new and different method, equally laborious and ſucceſsful, we underſtand, is practiſed by the Abbé de l'Epee of Berlin. We are informed * that he begins his inſtructions not by endeavouring to form the organs of ſpeech to articulate ſounds, but by communicating ideas to the mind by means of ſigns and characters: to effect this, he writes the names of things; and, by a regular ſyſtem of ſigns, eſtabliſhes a connection between theſe words and the ideas to be excited by them. After he has thus furniſhed his pupils with ideas, and a medium of communication, he teaches them to articulate and pronounce, and renders them not only grammarians but logicians. In this manner he has enabled one of his pupils to deliver a Latin oration in public, and another to defend a theſis againſt the objections of one of his fellow-pupils in a ſcholaſtic diſputation; in which the arguments of each were communicated to the other, but whether by ſigns or in writing is not ſaid; for it does not appear that the Abbé teaches his pupils to diſcern what is ſpoken, by obſerving the motion of the organs of ſpeech, which thoſe inſtructed by Meſſrs Braidwoods are able to do with aſtoniſhing readineſs.

There is perhaps no word, ſays the Abbé, more difficult to explain by ſigns than the verb *croire*, "to believe." To do this, he writes the verb with its ſignifications in the following manner:

*Je crois*
*Je dis oui par l'eſprit, Je penſe que oui.*
*Je dis oui par le coeur, J'aime à penſer que oui.*
*Je dis oui par la bouche.*
*Je ne vois pas des yeux.*

After teaching theſe four ſignifications, which he does by as many ſigns, he connects them with the verb, and adds other ſigns to expreſs the number, perſon, tenſe, and mood, in which it is uſed. If to the four ſigns, correſponding with the lines above mentioned, be added that of a ſubſtantive, the pupil will write the word *foi*, "faith;" but, if a ſign, indicating a participle uſed ſubſtantively, be adjoined, he will expreſs *la croyance*, "belief;" to make him write *croyable*, "credible," the four ſigns of the verb muſt be accompanied with one that indicates an adjective terminating in *able*; all theſe ſigns are rapidly made, and immediately comprehended.

M. Linguet, a member of the Royal Academy, having aſſerted that perſons thus inſtructed could be conſidered as little more than automata, the Abbé invited him to be preſent at his leſſons, and expreſſed his aſtoniſhment that M. Linguet ſhould be ſo prejudiced in favour of the medium by which he had received the firſt rudiments of knowledge, as to conclude that they could not be imparted by any other; deſiring him, at the ſame time, to reflect, that the connection between ideas and the articulate ſounds, by which they are excited in the mind, is not leſs arbitrary than that between theſe ideas and the written characters which are made to repreſent them to the eye. M. Linguet complied with the invitation; and the Abbé having deſired him to fix on ſome abſtract term which he would by ſigns communicate to his pupils, he choſe the word *unintelligibility*; which, to his aſtoniſhment, was almoſt inſtantly written by one of them. The Abbé informed him, that to communicate this word he had uſed five ſigns, which, though ſcarcely perceivable to him, were immediately and diſtinctly apprehended by his ſcholars: the firſt of theſe ſigns indicated an internal action; the ſecond repreſented the act of a mind that reads internally, or, in other words, comprehends what is propoſed to it; a third ſignified that ſuch a diſpoſition is poſſible; theſe, taken together, form the word *intelligible*: a fourth ſign transforms the adjective into the ſubſtantive; and a fifth, expreſſing negation, completes the word required. M. Linguet afterwards propoſed this queſtion, *What do you underſtand by metaphyſical ideas?* which being committed to writing, a young lady immediately anſwered on paper in the following terms: "I underſtand the ideas of things which are independent of our ſenſes, which are beyond the reach of our ſenſes, which make no impreſſion on our ſenſes, which cannot be perceived by our ſenſes." On reading this, we cannot help exclaiming with the poet, *Labor omnia vincit improbus!* a maxim by none more forcibly illuſtrated than by the Abbé de l'Epee.

*Periodical* DUMBNESS. In the Ephemerides of the Curious, we have an account of a periodical dumbneſs, which had continued for more than 15 years, and had not gone off at the time the account was wrote. The perſon was ſon to an inn-keeper at Jeſing in the duchy of Wirtemberg in Germany. He was one night taken ſo ill after ſupper, that he could neither ſtand nor ſit. He continued, for about an hour, oppreſſed with ſickneſs to ſuch a degree as to be in danger of ſuffocation. At the expiration of this time he grew better; but, during three months, he was much dejected, melancholy, and, at times, fearful. He was then ſuddenly ſtruck dumb, and became unable to pronounce the leaſt word, or form the leaſt ſound, though he could ſpeak very articulately before. The loſs of ſpeech was at firſt inſtantaneous, and continued only a few minutes: but the duration of it began to lengthen every day; ſo that it ſoon amounted to half an hour, two hours, three hours, and at laſt to 23 hours, yet without any order. At laſt the return of ſpeech kept ſo conſtant and regular an order, that, for 14 years together, he could not ſpeak except from noon, during the ſpace of one entire hour, to the preciſe moment of one o'clock. Every time he loſt his ſpeech, he felt ſomething riſe from his ſtomach to his throat. Excepting this loſs of ſpeech, he was afflicted with no other diſorder of any animal function Both his internal and external ſenſes continued ſound: he heard always perfectly well, and anſwered the queſtions propoſed to him by geſtures or writing.

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* *Nouv. Mem. de l'Academie Royale, &c. de Berlin*, 1785. [Mon. Rev. vol. lxxx. p. 651.]

writing. All ſuſpicion of deceit was removed by his keeping exactly the ſame hour, though he had no acceſs to any inſtruments by which time can be meaſured.

DUMFERMLINE, a parliament-town of Scotland, ſituated in the county of Fife, 15 miles north-weſt of Edinburgh: W. Long. 30. 20. N. Lat. 56. 15. Here was formerly a magnificent abbey and palace of the kings of Scotland, in which the princeſs Elizabeth, daughter of king James VI. and mother of the princeſs Sophia, from whom the preſent royal family are deſcended, was born. In the inn of this town is the marriage bed of James VI. and his queen; it is ſtill entire, and uſed by ſtrangers who lodge here. This place is noted for a manufactory of figured linen cloth called Diaper. The town gave title of earl to a baronet of the Seton family, which was forfeited in the year 1690.

DUMFRIES, a county in the ſouth of Scotland, comprehending the ſhire of Nithſdale, the ſtewartry of Annandale, and the lordſhip of Eſkdale, extends in length from north-weſt to ſouth-eaſt about 60 miles, and is about 30 miles in breadth where broadeſt. It is bounded on the ſouth-weſt by Galloway and part of Kyle; on the north-eaſt by the counties of Roxburgh, Selkirk, and Peebles; on the north-weſt by Clydeſdale; and on the ſouth eaſt by Solway Frith and the marches between Scotland and England. A great part of the country is mountainous and overſpread with heath, well ſtocked with game of all kinds: but the valleys, through which the Eſk, the Annan, the Nith, and other ſmaller rivers run, are extremely pleaſant; and ſome of them well cultivated and very fertile, and produce oats, barley, and wheat in abundance, both for maintaining the inhabitants and for exportation; while the mountainous parts afford paſture for innumerable flocks of ſheep and herds of black cattle, many thouſands of which are annually exported to England. In the valleys are ſeveral natural woods and ſome extenſive plantations of different kinds of timber. In the diviſion called *Nithſdale*, are the rich lead mines of Wanlockhead, the coal mines of Sanquhar and Cairnburn, the inexhauſtible lime-quarries of Cloſeburn and Barjarg, and free ſtone in almoſt every pariſh. Annandale has the rich lime-quarries of Kellhead and Comtongan, with plenty of free ſtone near the towns of Annan and Lochmaben: and in the lower part of Eſkdale are lime ſtone and coal in abundance.

DUMFRIES, the capital of the above mentioned county, a handſome town, ſituated on a ridge or riſing ground on the north-eaſt ſide of the river Nith, about 10 miles above where it falls into Solway Frith, in N. Lat. 55. 8. 30. Long. W. of Greenwich Obſervatory, 3. 56. Its ancient name, it is ſaid by ſome of the Scotch hiſtorians, was *Cotiac*; but on what authority we cannot tell. Its preſent name appears to have been derived partly from its ſituation, and partly from the monaſtery of Grey Friars that formerly ſtood near the head of the ſtreet called the *Friar-vennal*, the kitchen of which is all that now remains; being only a corruption of *Drum friars*, or "the eminence of the friary:" and accordingly, till within theſe 40 or 50 years, it was always ſpelt *Drumfries*, and not *Dumfries*, as it is now for the ſake of greater ſoftneſs. Beſides the pleaſantneſs of its ſituation on the ſide of a beautiful winding river, it is ſurrounded on all ſides with one of the fineſt and beſt cultivated ſheets of dale country that one can any where meet with, and the proſpect from it terminated at the diſtance of a few miles, by a continued chain of hills, forming altogether one of the grandeſt natural amphitheatres perhaps in Britain. There was anciently a ſtrong caſtle at the ſouth end of the town belonging to the Cummings, lords of Badenoch, of which there are now no remains. Another caſtle was afterwards built at the north-weſt end, which was taken down about 70 years ago. On the north-eaſt ſide of it, at ſome little diſtance, are the ruins of a chapel built by K. Robert Bruce, and endowed for a number of prieſts to ſay maſs for the repoſe of the ſoul of Sir Chriſtopher Seaton his brother-in-law, who was taken priſoner by Edward I. at Loch-Urr, and hanged at this place. It is now only employed as a burying place for ſuicides. It is not certain at what period Dumfries was erected into a royal borough; but it muſt have been before the middle of the eleventh century, as a grave-ſtone was diſcovered ſome time ago bearing the date of 1079, and mentioning the perſon buried under it to have been a merchant and burgeſs of the town: and that it was a place of conſequence in the beginning of the fourteenth century, is evident from this circumſtance, that Edward II. called the eſtates of Scotland to meet there in the year 1307. In the above mentioned monaſtery too, K. Robert Bruce killed his rival Cumming lord of Badenoch, with the aſſiſtance of James Lindſay and Roger Kirkpatrick, on the 5th of February 1305. As to the preſent ſtate of the town, the houſes are well built and commodious, the ſtreets ſpacious, open, and neatly paved. It has two very elegant churches, an epiſcopal chapel with a fine little organ, beſides three meeting-houſes belonging to different deſcriptions of ſectaries; a tolbooth; a council-chamber; a trades hall; a meal-market; a ſtrong priſon; a correction-houſe; a large hoſpital; an infirmary, with apartments for inſane patients; a narrow bridge of 9 arches over the river, ſaid to have been built by one of the three daughters and coheireſſes of Alan lord Galloway. A large village, called the *Bridge-end*, ſtands on the oppoſite ſide, and is within the ſtewartry of Kirkcudbright. The aſſizes for the county, and for the ſhire of Galloway and ſtewartry of Kirkcudbright, are held in the town twice a-year. It is alſo the place for holding the ſheriff and commiſſary courts, the quarter-ſeſſions of the peace, and the courts of the commiſſioners of ſupply. It is governed by a provoſt, three bailies, a dean of guild, and a town-council, compoſed of merchants and the conveener and deacons of the incorporated trades, of which there are ſeven, viz. ſquare-men, ſmiths, weavers, tailors, ſhoemakers, ſkinners, and butchers; all of whom are choſen into their reſpective offices at Michaelmas annually. The trades got from king James VI. in one of his journeys to England, a ſmall ſilver tube, like a piſtol barrel, called the *ſilver gun*, with his royal licence to ſhoot for it every year. At that feſtival they all appear in arms, and march out of the town under their reſpective colours, to ſome convenient place, where they ſhoot at a mark; and the perſon that hits or ſhoots neareſt to it, returns to town, marching at the conveener's right hand, with the ſilver gun tied to his hat with ribbons; after which they conclude the day with a ſocial entertainment. The town has a weekly market on Wedneſday, with two annual fairs, the firſt on the Wedneſday on or next after the 13th of February, and the other on the Wedneſday on or next after the 25th of September. At theſe fairs vaſt numbers of horſes and black cattle are ſold; and no town in Scotland is better provided with all ſorts of butcher-meat in their ſeaſon. But though well ſituated for fuel at a cheap rate, it has only two manufactures, one for ſtockings and the other for cottons; but the latter only in its infancy. Its foreign trade for many years has only conſiſted in timber, iron, and other articles for home conſumption. It gives the title of Earl to the chief of the family of Crichton; and is the ſeat of a preſbytery and provincial ſynod. It contains about 6000 inhabitants.

DUMONT (Francis), a Frenchman; compiler of a general collection of treaties of commerce, alliance, and peace, between the powers of Europe. This collection, with Barbeyrac's, containing the treaties B. C. makes 16 vols folio, very uſeful for hiſtorical writers. Dumont retired to Holland in 1720. The time of his death is uncertain.

DUMOSÆ (from *dumus*, a buſh), an order of plants in the *Fragmenta methodi naturalis* of Linnæus, containing the following *genera*, viz. *Viburnum, Tinus, Opulus, Sambucus, Rondeletia, Bellonia, Caſſine, Ilex, Tomax*, &c.

Plate CLXV.

DUN, or BURGH, the name of an ancient ſpecies of buildings, of a circular form, common in the Orkney and Shetland iſlands, the Hebrides, and northern parts of Scotland. The latter term points out the founders, who at the ſame time beſtowed on them their natal name of *borg*, "a defence or caſtle," a Sueo-Gothic word; and the Highlanders univerſally apply to theſe places the Celtic name *dun*, ſignifying a hill defended by a tower, which plainly points out their uſe. They are confined to the countries once ſubject to the crown of Norway. With few exceptions, they are built within ſight of the ſea, and one or more within ſight of the other; ſo that on a ſignal by fire, by flag, or by trumpet, they could give notice of approaching danger, and yield a mutual ſuccour. In the Shetland and Orkney iſlands, they are moſt frequently called *wart* or *wardhills*, which ſhows that they were garriſoned. They had their wardmadher, or watchman, a ſort of centinel, who ſtood on the top, and challenged all who came in ſight. The gackman was an officer of the ſame kind, who not only was on the watch againſt ſurprize, but was to give notice if he ſaw any ſhips in diſtreſs. He was allowed a large horn of generous liquor, which he had always by him, to keep up his ſpirits. Along the Orkney and Shetland ſhores, they almoſt form a chain; and by that means not only kept the natives in ſubjection, but were ſituated commodiouſly for covering the landing of their countrymen, who were perpetually roving on piratical expeditions. Theſe towers were even made uſe of as ſtate-priſons; for we learn from Torfæus, that after Sueno had ſurpriſed Paul, count of Caithneſs, he carried him into Sutherland, and confined him there in a Norwegian tower. Out of our own kingdom, no buildings ſimilar to theſe are to be found, except in Scandinavia. On the mountain Swalberg in Norway is one; the Stir-biſkop, at Upſal in Sweden, is another; and Umſeborg, in the ſame kingdom, is a third.

Theſe towers vary in their inner ſtructure; but externally are univerſally the ſame; yet ſome have an addition of ſtrength on the outſide. The burgh of Culſwick in Shetland, notwithſtanding it is built on the top of a hill, is ſurrounded with a dry ditch 13 feet broad; that of Snaburgh in Unſt, has both a wet and a dry ditch; the firſt cut, with great labour, through the live rock. The burgh of Moura is ſurrounded by a wall, now reduced to a heap of ſtones, and the inſide is cylindrical, not taper, as uſual with others. The burgh of Hogscter, upon an iſle in a loch of the ſame name, has alſo its addition of a wall; a peculiarity in a cauſeway, to join it to the main land, and a ſingular internal ſtructure. Numbers of little burghs, with ſingle cells, are ſcattered about theſe iſlands, in the neighbourhood of the greater; and which probably were built by the poorer ſort of people, in order to enjoy their protection. A multitude of places in theſe iſlands have the addition of burgh to their names, notwithſtanding there is not a veſtige of a tower near them; the materials having long ſince been carried away, and applied to various uſes.

DUNBAR, a parliament town of Scotland, in the ſhire of Eaſt-Lothian, once remarkable for a ſtrong caſtle, the key of Scotland from the eaſt, and which gave ſhelter to Edward II. of England in his flight from Bannockburn, but of which ſcarce a veſtige now remains. Here are ſtill preſerved ſome of the Scottiſh pikes, ſix ells long, and formed for both offence and defence. This town has now a tolerable trade in the fiſheries, and is remarkable for making good malt. Dunbar has given titles of honour to different families, who are all now extinct.

DUNBARTON, the chief town of Lenox or Dunbarton ſhire in Scotland, ſituated in W. Long. 4. 32. N. Lat. 56. 30. It is remarkable for nothing but its caſtle. This is a ſteep rock, riſing up in two points, and every where inacceſſible, except by a very narrow paſſage or entry, fortified with a ſtrong wall or rampart. Within this wall is the guard-houſe, with lodgings for the officers; and from hence a long flight of ſtone-ſteps aſcends to the upper part of the caſtle, where there are ſeveral batteries mounted with cannon, the wall being continued almoſt round the rock. In the middle of this upper part where the rock divides, there are commodious barracks with a deep well, in which there is always plenty of water. Here likewiſe are the remains of a gateway and prodigious high wall, at the top of which there was a wooden bridge of communication from one rock to another. This gateway was ſometimes blocked up during the inteſtine commotions of Scotland, ſo that garriſons of different factions poſſeſſed different parts of the caſtle, and each had a gate towards the water. The caſtle ſtands in the angle formed at the conflux of the Clyde and Leven; ſo that it is wholly ſurrounded by water, except a narrow iſthmus, and even this is overflowed at every ſpring-tide: nor is there any hill or eminence within a Scots mile of this fortreſs. It commands the navigation of the Clyde; and, being deemed the key of the weſtern Highlands, is kept in ſome repair, and garriſoned with invalids, under the command of a governor and ſome ſubaltern officers. The government of it is worth 700 l. a-year.——Dunbarton is a royal borough; and formerly gave title of Earl to a branch of the family of Douglas.

DUNCANNON, a fort in the county of Wexford, and province of Leinſter, in Ireland, ſeated on the river Roſs. It commands the river, inſomuch that no ſhip can paſs to Waterford or Roſs without its permiſſion. Here are barracks for three companies of foot. W. Long. 6. 30. N. Lat. 52. 10.

DUNCARDS, DUNKERS, or *Tunkers*. See TUNKERS.

DUNCOMBE (William), younger ſon of John Duncombe, Eſq; of Stocks in Hertfordſhire, in 1722 publiſhed a tranſlation of Racine's Athaliah; which was well received by the public, and has gone through three editions. In 1724 he was editor of the works of Mr Needler; in 1735, of the poems of his deceaſed brother-in-law, Mr Hughes, 2 vols 12mo; in 1737, of the miſcellanies of his younger brother Mr Jabez Hughes, for the benefit of his widow, in one volume 8vo; and in 1745, of the works of the Rev. Mr Samuel Say, in one volume 4to. In 1726 he married the only ſiſter of John Hughes, Eſq; whom he long ſurvived. In 1734 his tragedy of Lucius Junius Brutus was acted at Drury-Lane Theatre. It was publiſhed in 1735, and again in 1747. The works of Horace, in Engliſh verſe, by ſeveral hands, were publiſhed by him in two vol. 8vo, with notes, &c. in 1757. A ſecond edition, in four vols 12mo, with many imitations, was publiſhed in 1762. In 1763 he collected and republiſhed "Seven ſermons by archbiſhop Herring, on public occaſions, with a biographical preface." He died Feb. 26. 1769, aged 80.

DUNDALK, a town of Ireland, in the county of Louth, about 40 miles from Dublin. It is a large, ancient, and thriving town, with a wide ſtreet, near a mile long, and a very fine market-houſe, near the entrance from Dublin. In the reign of Edward II. it was a royal city, and the laſt we read of where a monarch of all Ireland was actually crowned and reſided. It was formerly very ſtrong, and had many towers and ſmall caſtles in it. It is very advantageouſly ſituated for a moſt extenſive inland trade, and the port is very ſafe for ſhipping. The bay has good moorings at all times, in four to upwards of eight fathoms water, with very good land-marks, either for bringing up to, or making the harbour; and in croſſing the bar at high water, or ordinary neap tides, there is from 15 to 18 feet water. The only cambric manufacture in Ireland is carried on in this town.

DUNDEE, a parliament town of Scotland, in the ſhire of Forfar or Angus, is ſeated on the north ſide of the river Tay, about 12 meaſured miles from its mouth, 40 meaſured miles north of Edinburgh, and 22 eaſt from Perth, in W. Long. 2. 48. N. Lat. 56. 26. Its ſituation for commerce is very advantageous. Trading veſſels of the largeſt burden can get into the harbour; and on the quay there are three very convenient and handſome warehouſes built in 1756, as well as good room for ſhipbuilding, which is carried on to a large extent. The houſes are built of ſtone, generally three and four ſtories high. The market-place or high ſtreet in the middle of the town is a very ſpacious oblong ſquare, 360 feet long and 100 feet broad; from whence branch out the four principal ſtreets, which with a number of leſſer ones are all paved in the beſt manner. On the ſouth ſide of the market-place ſtands the town-houſe; an elegant ſtructure, with a very handſome front, piazzas below, and a neat ſpire over it 140 feet high. This building was finiſhed in the year 1734, and contains the guild-hall, the court-room, a very neat maſon-lodge, the bank, vaulted repoſitories for the records, and the common priſon, which is in the upper ſtory, and does honour to the taſte and humanity of the magiſtrates, under whoſe auſpices it was conſtructed, being well aired commodious rooms, at the ſame time very ſtrong and ſecure. Each priſon is 20 feet by 12, and 7½ feet high, well arched above and below.

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The meal-market and ſhambles, which were formerly on the high ſtreet, and eſteemed a nuiſance, were removed ſome years ago; and in the place of the ſhambles, there is now erected by the incorporated trades, on the eaſt end of the above large ſquare, a grand building, with a large and elegant cupola: in the ground-flat of which is a very neat coffee-room, and ſeveral merchant ſhops; and in the upper ſtories public rooms for each trade, and a common hall occaſionally uſed as a theatre. This hall is 50 feet long, 30 feet broad, and 25 feet high; having its front to the ſquare decorated with Ionic columns.

The opulence of the corporations, nine in number, may be inferred from this, that they had, along with the kirk-ſeſſion, but very lately finiſhed a moſt elegant church when they ſet about building the hall. This church, which is called *St Andrew's Church*, ſtands on a riſing ground a little north from the Cowgate ſtreet; and has an elegant ſpire 130 feet high, with a peal of bells much admired. There is a neat entry to the church by a broad gravel walk, with graſs plots on every ſide; and the whole policies around it are laid out with excellent taſte, and in a ſuperb ſtile, as complete and well executed as any in Scotland.

Dundee, beſide St Andrew's church, has four other churches, and five miniſters on the legal eſtabliſhment. The old church, in which were originally four places of worſhip, when entire, had been a very magnificent building, with a large ſquare Gothic tower or ſteeple 186 feet high, on the weſt end of the church. This building was in the form of a croſs, erected by David Earl of Huntington, brother to William I. of Scotland (ſurnamed the Lion), and was dedicated to the Virgin Mary. This he did on his return from the third cruſade (in which with 500 of his countrymen he had accompanied Richard I. of England) *anno* 1189, in gratitude for his deliverance from ſeveral imminent dangers, and particularly from ſhipwreck, by which he had nearly periſhed when in ſight of this town. At the ſame time he changed the name of the town from *Allectum* to *Dei Donum*, whence its preſent name is thought by many to be derived; while others maintain that its name was *Duntay*, or "the Hill of Tay." The word *Allectum* in the Gaelic ſignifies "beautiful," and harmonizes very well with the ſcripture ſenſe of the Hill of God. The word *Duntay* has the very ſame ſignification, "the Hill of God;" and both agree with the delightful ſituation of Dundee, and unite in giving it with propriety the name of *Bonny Dundee*. The hill riſes on the north of the town to a great height, and is called *The Law of Dundee*; *law* being a Saxon word for a round hill ſuch as it is. On its

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top there are evidently the remains of a camp, ſaid to have been firſt erected by Edward I. of England. and laſtly repaired by General Monk. Where the meal-market ſtood is now erected an elegant Epiſcopal meeting-houſe, with handſome ſhops below.

Dundee had an old caſtle which was demoliſhed by the famous Scots governor Sir William Wallace, who was educated in this town. The caſtle had proved very uſeful to Edward I. when he put a garriſon into it to awe the inhabitants; but Wallace getting poſſeſſion, ordered it to be deſtroyed, leſt it ſhould again fall into the hands of the Engliſh. This treatment ſo exaſperated Edward, that, taking the town by ſtorm, he ſet fire to the churches; and a number of the inhabitants having taken ſanctuary there with their moſt valuable effects, were all burnt along with them. At that time he burnt alſo a great part of the town. The deſolation he brought on the church has continued ever ſince, till the year 1787, when a noble edifice began to be built on the ſite of the one that was burnt down, and is now finiſhing; in which the ancient Gothic of the outſide is excellently united with internal modern architecture, making one of the largeſt and neateſt churches in the kingdom, and again completing the ſuperb ſuperſtructure as erected at the firſt by the Earl of Huntington.

This town ſuffered greatly laſt century during the troubles of Charles II. and the uſurpation of Oliver Cromwell; being ſometimes under the command of one party, and at others in the mercy of another. In 1645 the Marquis of Montroſe took it by ſtorm; and in 1651, under the command of its provoſt Major General Lumſden, it vigorouſly oppoſed General Monk, who carried it by ſtorm the firſt of September, and put all in arms to the ſword. And ſo great were the riches of Dundee, all the neighbouring gentlemen having retired to it with their beſt effects as a place of ſafety, that every private ſoldier in General Monk's army had near 60 l. Sterling to his ſhare of the plunder; there being above 60 merchant veſſels in the harbour at that time, and the like number of veſſels ſailed for England loaded with the ſpoils of the unfortunate inhabitants. By theſe and other invaſions, the whole ancient records of the town were deſtroyed, except a deed of Queen Mary, ſigned by herſelf, conferring the preſent burying ground; and ſome charters of the Charles's, confirming the ancient rights and privileges as diſponed by the Alexanders and others kings of Scotland. This burying-ground is the only place in Scotland we know of called *The Hoff*, a Dutch word bearing all the ſenſes of the Engliſh word *court*, having been formerly the burying-ground of one of the many religious houſes that were in this town previous to the Reformation.

Dundee at preſent has 113 veſſels belonging to the port, of above 8200 tons burden, and near 1000 ſeamen. Of theſe veſſels four went laſt ſeaſon to Greenland, a trade of long ſtanding here. And beſide the three public warehouſes on the ſhore, there are above twenty large private warehouſes belonging to the merchants. The magiſtrates have been lately and ſtill are at great expence in enlarging and fitting up the harbour, ſo as to render it of eaſy acceſs, ſafe, and commodious; and have now made the paſſage over the Tay, where there is a great reſort, ſo convenient, that travellers with their horſes can get over at any time of tide, and a ſufficient number of good boats properly manned are always ready. The river Tay oppoſite Dundee is about three miles broad; and being ſheltered by high lands on both ſides, is a ſafe road for ſhips of the greateſt burden: the piers are extenſive, broad, and well adapted for the purpoſes of loading and diſcharging veſſels; and when the harbour is completed in the plan they are preſently engaged in, there will not be one ſuperior to it in Scotland.

To enable the town to repair the damage done by Cromwell's army, and alſo their harbour and other public works, Charles II. granted them a ſmall impoſt of one-ſixth of a penny Sterling, for 25 years, on the pint of ale brewed or brought into the town for ſale; which grant has been frequently renewed by ſubſequent parliaments; and the fund ariſing therefrom is moſt properly beſtowed by the magiſtrates in improving the town, and making it more convenient and healthy. For theſe purpoſes, ſeveral new ſtreets have been made, the old ones have been widened, and a large convenient one at a conſiderable expence carried down from the market-place to join a fine walk, ſhaded very neatly with trees, that leads to the ſhore. This new ſtreet makes the acceſs eaſy and commodious, which was formerly much confined and ſteep.

Till the year 1745, the town had only draw-wells; but ſince that period it is moſt amply ſupplied from a large fine fountain of excellent water, conveyed through the town in lead pipes, and diſcharged by good wells at proper diſtances. Theſe, with a fine well in the town's meadows, and a ſtream of water that runs thro' the ward and the meadows (two large beautiful greens on the north of the town), make it as well watered as any town in Scotland; and theſe greens, juſt at hand, ſerve all the inhabitants moſt commodiouſly for the neceſſary labours of waſhing and bleaching.

The number of inhabitants in Dundee have increaſed above 4000 ſince 1780. There was then an accurate liſt of them taken, when they amounted to near 16,000; and lately they were reckoned and found within a few of 20,000; and ſince the year 1760 they are fully doubled. Beſide the eſtabliſhed churches, there are three Epiſcopal meeting-houſes, two of Seceders, one of Methodiſts, two of Independents, one Berean, and two Anabaptiſts. One of the Independents is of the Glaſſite denomination. Mr John Glaſs, from whom they take that name, reſided here; and his principles, though ſpread far and wide, have always had the greateſt following in Dundee.

The trade in the town has increaſed amazingly of late. Its ſtaple is undoubtedly the linen manufacture: for which in ſummer 1788 they imported from the Baltic 32 cargoes of flax, hemp, &c. near 3000 tons, beſide ſeveral quantities from London, Leith, and other places; and on an average the brown linen ſtamped for the two preceding ſeaſons at the ſtamp-office here amounted to about four millions of yards, in value about 115,000 l. Sterling. The flax is wrought up into coarſe linens, chiefly Oſnaburgs, ſheetings, ſoldiers ſhirtings, &c. which is ſold partly bleached (ſeveral fine large bleachfields being well employed in the neighbourhood) and partly brown. Theſe linens are ſent principally to London, Glaſgow, and Liverpool, and from thence exported. Seven or eight

eight veſſels are conſtantly employed in the trade between Dundee and London, one of which ſails every ten or twelve days. The making ſail-cloth has been long eſtabliſhed here, and is carried on to a good extent. Two rope-works have ſucceeded well, and a buckram-work has alſo been eſtabliſhed for ſeveral years. The Dundee coloured threads have been long juſtly eſteemed, and give bread to a great number of people; indeed it was here that coloured threads firſt made a figure among the articles of trade in Scotland. Their ſugar-houſe, a large undertaking, and tan works, are of eſtabliſhed reputation. There has been lately erected a large glaſs-work at a great expence, and a plumbery and foundery are alſo now carried on to advantage. No doubt the trade of the place has been greatly promoted by the Bank; which is carried forward on the ſureſt and moſt ſteady footing, and has always managed the buſineſs of the town and neighbourhood in ſuch a way as to keep any other eſtabliſhment of that kind from taking place. Of late the cotton manufactory has been introduced; a number of jennies being employed in ſpinning, and ſeveral looms in weaving it. A large machine for ſpinning ſhorts or backens into candlewicks, the firſt of the kind in Scotland, is alſo begun to work here, and promiſes to do well. A ſpirit for literature and education has greatly prevailed of late years in Dundee: for beſide the public grammar-ſchool, which has an able rector and two good maſters; the public Engliſh and writing ſchool, where are three very proper maſters; there is alſo lately eſtabliſhed, and much encouraged, an academy for mathematics, French, Italian, and the polite arts, with maſters ſuitable for the different branches, and a large apparatus for natural philoſophy.

The ſalmon fiſhing in Tay is of much conſequence; and the town is generally well ſupplied with fiſh of various kinds, though like every other article of living much raiſed in price of late years. Their other markets are alſo well ſupplied. An excellent nurſery at the weſt end of the town has been much encouraged; and its neighbourhood is now adorned with many neat and elegant villas, ſhowing the wealth and taſte of the inhabitants.

Dundee is the birth-place of the celebrated and learned Hector Boethius, whoſe Hiſtory of Scotland has been long in much reputation with many. It, with Perth, Forfar, St Andrew's, and Cupar, returns one member to the Britiſh parliament.

DUNFERMLINE. See Dumfermline.

DUNG, in huſbandry. See Agriculture, n° 20.

*Dung-Bird.* See Upupa.

*Dung Meers*, in huſbandry, places where ſoils and dungs are mixed and digeſted together. Theſe conſiſt of pits, prepared at the bottom with ſtone and clay, that they may hold water, or the moiſture of the dung; and ought to be ſo ſituated, that the ſinks and drips of the houſes and barns may run into them. Into theſe pits they caſt refuſe, fodder, litter, dung, weeds, &c. where they lie and rot together, till the farmer have occaſion for them.

*Dung Worms*, a ſpecies of fly-worms, of a ſhort and ſomewhat flat body, found in great plenty among cow-dung in the months of September and October.

DUNGANNON, the chief town of the county of Tyrone, in the province of Ulſter in Ireland. It is ſeated on a hill, and is a place of ſome ſtrength.

DUNGARVON, a town of Ireland, in the county of Waterford. It ſtands on a bay of the ſame name, has a commodious harbour for ſhips, and is a walled town with a caſtle. W. Long. 7. 55. N. Lat. 51. 57.

DUNIPACE. See the article Carron.

DUNKELD, a town of Scotland, in the ſhire of Perth, ſeated on the north ſide of the river Tay, in a ſituation truly romantic, under and among very high and almoſt inacceſſible craggs, part naked and part wooded. It is the chief market town of the Highlands, and has been greatly improved with buildings by the Dukes of Athol.

The place is of great antiquity. It was the capital of ancient Caledonia. About the dawn of Chriſtianity, a Pictiſh king made it the ſeat of religion, by erecting a monaſtery of Culdees there; which King David I. in 1130 converted into a cathedral, and it ranked as the firſt in Scotland. The entire ſhell of the cathedral ſtill remains, the eaſt end ſerving for a kirk, on the north ſide of which is the burial place of the Dukes of Athol. The ſtyle of architecture is ſimple and elegant, the pillars round. The monument of one of its biſhops remains in the ſouth aiſle of the nave, as alſo that of Alexander Stuart Earl of Buchan, third ſon of Robert II. called for his cruelty *The Wolf of Badenoch*, who died 1394. The tower at the weſt end, with a ſingular crack down one of its ſides, adds to the pictureſque appearance which the whole makes among the venerable pines at the end of the Duke's garden. His Grace's ſeat is a modern building, and not large, with pleaſant walks and policies, and a fine caſcade on the water of Bran, which in its way from the weſtern hills forms an aſtoniſhing fall of 150 feet, called the *Rumbling Brig*, from a narrow bridge made by the fall of two rocks acroſs the ſtream. The pencil of Roſa never formed a more horrid ſcene. The ſtream has a ſecond fall, which, without ſeeing the other, would be deemed capital. Sir James Galloway, maſter of requeſts to James VI. and Charles I. was created Lord Dunkeld 1645, whoſe grandſon James was attainted at the Revolution, and dying at the beginning of this century, the title became extinct.

DUNKERS, Duncards, or *Tunkers*. See Tunkers.

DUNKIRK, a maritime town of the French Netherlands, ſituated in E. Long. 2. 28. N. Lat. 51. 10. and is the moſt eaſterly harbour on the ſide of France which is next to Great Britain.—It was originally a mean hamlet, conſiſting only of a few fiſhermens huts: but a church being built there, it was from that, and from its ſituation, which is a ſandy eminence, called *Dunkirk; dun* ſignifying, in the old Gallic language, a hill; and *kirk* being the old Flemiſh name for church.

About the year 960, Baldwin Earl of Flanders, thinking the ſituation convenient, enlarged it into a kind of town, and ſurrounded it with a wall. In the year 1322, Robert of Flanders, who held it as an appendage, built a caſtle for its defence; which was afterwards demoliſhed by the revolters of Flanders. Robert of Bar erected a fortification round it, the remains of which are viſible on the ſide next the harbour. The emperor Charles V. who held it as part of Flanders, built another caſtle to defend the harbour; but this was alſo demoliſhed ſoon afterwards. In 1558, the French, under Marſhal de Thermes, took Dunkirk by ſtorm, and almoſt ruined the place; the Spaniards recovered it again in about a fortnight, and put all the French to the ſword.

During a peace procured for the Dunkirkers by Philip II. of Spain, they rebuilt their town with greater ſplendor than before, and the inhabitants for a long time ſubſiſted by privateers fitted out againſt the Dutch; and at length, growing rich by theſe hoſtilities, they fortified their town and harbour, and fitted out no leſs than 15 ſhips of war at their own charge.

In 1634, the Dunkirkers agreed with the inhabitants of Bergues to dig a canal, at their joint expence, for a communication between the two towns; which was ſome time afterwards effected. By this time, Dunkirk was become the beſt harbour the Spaniards poſſeſſed in Flanders, which induced many foreigners to ſettle there; and it being neceſſary to enlarge the town for their accommodation, a new fortified wall was built at a conſiderable diſtance from the former. In 1646, it was beſieged and taken by the prince of Condé. In 1652 it was retaken by the archduke Leopold, then governor of the Netherlands. France entering into a treaty with England in 1655, the Dunkirkers, with views of pecuniary advantage, fitted out privateers againſt both thoſe powers: the conſequence of which was, that the French, aſſiſted by Cromwell, attacked and took it; and it was put into the hands of the Engliſh, in conſequence of a treaty between them and the French. To the Engliſh it was even then of very great importance; for, during the war in which it was taken, the Dunkirkers had made prizes of no leſs than 250 of their ſhips, many of which were of great value. They therefore improved the fortifications, and built a citadel: yet they kept it only four years; for in 1662, two years after the reſtoration, Charles II. ſold this valuable acquiſition to France, for the paltry ſum of 500,000l. In conſequence of this ſale, the town was taken poſſeſſion of for the French king Louis XIV. by the count d'Eſtrades, on the 29th of November 1662. Louis having acquainted the celebrated engineer Monſieur Vauban, that he intended to make Dunkirk one of the ſtrongeſt places in Europe, Vauban drew up a plan with that view, which was gradually executed. An arſenal was erected, large enough to contain all the ſtores neceſſary for fitting out and maintaining a large fleet of men of war; the fortifications on the land-ſide were conſtructed in a manner that was thought to render them impregnable; and towards the ſea, the entrance of the harbour being properly formed, it was fortified by the jetties, and the two forts called *Green Fort* and the *Fort of Good Hope* at their extremities; the famous Riſbank was alſo erected on one ſide of the jetties, and Fort Galliard on the other, to ſecure the town. Theſe works were all completed in 1683; and in 1685, the whole circumference of the baſon was faced with maſonry, and the keys completely formed: at the ſame time care was taken to build at the entrance of this baſon a ſluice, almoſt 45 feet wide, that the ſhips within might be conſtantly afloat. In 1689, the fort called the *Cornichon*, and ſome other works, were completed. But though 30 years had been now employed in improving the fortifications of Dunkirk, it was not yet in the ſtate in which Louis intended to put it; and therefore, in 1701, he cauſed a new riſbank to be built, called *Fort Blanc*.

At the treaty of Utrecht, it having been made appear, that the privateers of Dunkirk had, during the war then cloſing, taken from the Engliſh no leſs than 1614 prizes, valued at 1,334,375 l. Sterling, it was ſtipulated, that the fortifications of the city and port of Dunkirk ſhould be entirely demoliſhed, and the harbour filled up, ſo as never to be an harbour again.

The treaty, of which this demolition of Dunkirk was an article, was ſigned on the 28th of April 1713; but the demolition did not take place till the September following, when the queen deputed colonel Armſtrong and colonel Clayton to overſee the execution of the treaty as far as concerned the works and harbour of Dunkirk.

Under the inſpection of theſe gentlemen, the places of arms were broken down, the ditches filled up, and the demi-lunes, baſtions, and covered way, totally deſtroyed; the citadel was razed, and the harbour and baſon filled up; the jetties were alſo levelled with the ſtrand, and all the forts which defended the entrance into the harbour were demoliſhed. A large dam, or bar, was alſo built acroſs the mouth of the harbour between the jetties and the town, by which all communication between the harbour and the canal, which formed its entrance, was entirely cut off. The ſluices were alſo broken up, and the materials of them broken to pieces.

But this was no ſooner done, than Louis XIV. ordered 30,000 men to work inceſſantly upon a new canal, the canal of Mardick, which in a ſhort time they accompliſhed; by which the harbour was rendered almoſt as commodious as ever: but in 1717 this likewiſe was rendered unſerviceable.

In the year 1720, during a great ſtorm, the ſea broke up the bar or dam, and reſtored to the Dunkirkers the uſe of the harbour in a very conſiderable degree.

In the year 1740, when Great Britain was engaged in a war with Spain, Louis XV. ſet out about improving the advantage which Dunkirk had derived from the ſtorm in 1720, by reſtoring the works, and repairing the harbour. He rebuilt the jetties and erected new forts in the place of thoſe which had been deſtroyed; and ſoon afterwards he eſpouſed the cauſe of Spain, and became a principal in the war againſt us.

But at the peace of Aix-la-Chapelle in 1748, it was ſtipulated, that all the works towards the ſea ſhould be deſtroyed a ſecond time; yet, before the declaration of the laſt war, the place was in as good a ſtate of defence towards the ſea as it was at any time during the war which was concluded by the treaty of Aix-la-Chapelle.

DUNSE, a market-town of Scotland, in the ſhire of Mers, ſituated in W. Long. 2. 15. N. Lat. 55. 42. It is ſeated on a riſing ground in the middle of the ſhire, and has a weekly market for cattle. It is by ſome reputed the birth-place of the famous John Duns Scotus.—A mile ſouth of the town is a well of mineral water, of great uſe as a deobſtruent and antiſcorbutic, firſt diſcovered in 1747 by Dr Thomas Simpſon who practiſed there.

DUNS SCOTUS (John), a Franciſcan friar, commonly called *Doctor Subtilis*, was born in the year 1274; but whether in England, Scotland, or Ireland, hath long been a matter of diſpute among the learned of each nation. Dempſter, Mackenzie, and other Scottiſh writers, aſſert poſitively that he was born at Dunſe, a town in Scotland, about 15 miles from Berwick; and, to ſecure him more effectually, Mackenzie makes him deſcended from the Dunſes in the Mers. MacCaghwell, an Iriſh author, who wrote the life of this Scotus, proves him to have been born at Down in the province of Ulſter in Ireland: but Leland, Bale, Camden, and Pits, aſſure us, that he was born at Dunſtone in the pariſh of Emildune, near Alnwick in Northumberland; and this opinion is rendered probable by the following concluſion of his manuſcript works in the library of Merton college in Oxford.—"Here end the writings of that ſubtile doctor of the univerſity of Paris, John Duns, who was born in a certain village, in the pariſh of Emildune, called *Dunſton*, in the county of Northumberland." We are told, that, when a boy, he became accidentally known to two Franciſcan friars; who, finding him to be a youth of very extraordinary capacity, took him to their convent at Newcaſtle, and afterwards perſuaded him to become one of their fraternity. From thence he was ſent to Oxford, where he was made fellow of Merton college and profeſſor of divinity; and Mackenzie ſays, that not leſs than 30,000 ſtudents came to Oxford to hear his lectures. His fame was now become ſo univerſal, that the general of his order commanded him to go to Paris, that the ſtudents of that univerſity might alſo profit from his lectures. He went to Paris in the year 1304, where he was honoured firſt with the degree of bachelor, then of doctor of divinity, and in 1307 was appointed regent of the divinity ſchools: during his reſidence here, the famous controverſy about the *Immaculate conception of the virgin Mary* aroſe. Albertus Magnus maintained that ſhe was born in original ſin. Scotus advanced 200 arguments in ſupport of the contrary opinion, and convinced the univerſity of Paris that ſhe was really conceived immaculate. This important nonſenſe, however, continued to be diſputed till the year 1496, after the council of Baſil, when the univerſity of Paris made a decree, that no ſtudent, who did not believe the *immaculate conception*, ſhould be admitted to a degree. Our author had not been above a year at Paris, when the ſame general of the Franciſcans ordered him to remove to Cologne; where he was received with great pomp and ceremony by the magiſtrates and nobles of that city, and where he died of an apoplexy ſoon after his arrival, in the year 1308, in the 34th year of his age. Some writers have reported, that Scotus was buried in an epileptic fit; and that, upon removing his bones, he appeared to have turned himſelf in his coffin. This *doctor ſubtilis* was doubtleſs one of the firſt wranglers of his time, admirably well verſed in ſcholaſtic divinity, and a moſt indefatigable ſcribbler; but the misfortune is, that all his huge volumes do not contain a ſingle page worth the peruſal of a rational being. He was the author of a new ſect of ſchoolmen called *Scotiſts;* who oppoſed the opinions of the Thomiſts, ſo called from St Thomas Aquinas. The reader will find a more particular account of Scotus in the Franciſcan Martyrology, publiſhed at Paris in 1638.—He was a moſt voluminous writer; his works making 12 vols. folio, as publiſhed at Lyons by Luke Wadding, 1639.

DUNSTABLE, a town in Bedfordſhire, with a market on Wedneſdays. It is ſeated on a chalky hill; and has ponds in the ſtreets, which are never dry tho' only ſupplied with rain water. It is remarkable for ſeveral good inns, it being a great thoroughfare on the northern road. It conſiſts of four ſtreets, interſecting each other at right angles; and in the centre ſtood one of thoſe beautiful croſſes of queen Eleanor, which was deſtroyed by the enthuſiaſts in the time of the civil wars. W. Long. 0. 29. N. Lat. 51. 50.

DUNSTAFFNAGE. See LORNE.

DUNSTAN, a famous ſaint, and archbiſhop of Canterbury; of whom the monkiſh hiſtorians give us the following account. He was deſcended from a noble family in Weſſex, and educated in the abbey of Glaſtonbury. Here he ſtudied ſo hard, that it threw him into a violent fever which brought him to the very point of death. When the whole family were ſtanding about his bed, diſſolved in tears, and expecting every moment to ſee him expire, an angel came from heaven in a dreadful ſtorm, and gave him a medicine which reſtored him to perfect health in a moment. Dunſtan immediately ſtarted from his bed, and run with all his ſpeed towards the church to return thanks for his recovery; but the devil met him by the way, ſurrounded by a great multitude of black dogs, and endeavoured to obſtruct his paſſage. This would have frightened ſome boys; but it had no ſuch effect upon Dunſtan; who pronouncing a ſacred name, and brandiſhing his ſtick, put the devil and all his dogs to flight. The church-doors being ſhut, an angel took him in his arms, conveyed him through an opening in the roof, and ſet him ſoftly down on the floor, where he performed his devotions. After his recovery, he purſued his ſtudies with the greateſt ardor, and ſoon became a perfect maſter in philoſophy, divinity, muſic, painting, writing, ſculpture, working in gold, ſilver, braſs, and iron, &c. When he was ſtill very young he entered into holy orders, and was introduced by his uncle Athelm archbiſhop of Canterbury to King Athelſtan; who, charmed with his perſon and accompliſhments, retained him in his court, and employed him in many great affairs. At leiſure hours he uſed to entertain the king and his courtiers with playing on his harp, or ſome other muſical inſtrument; and now and then he wrought a miracle, which gained him great admiration. His old enemy the devil was much offended at this, and prompted ſome envious courtiers to perſuade the king that his favourite was a magician, which that prince too readily believed. Dunſtan diſcovering by the king's countenance that he had loſt his favour, and reſolving to reſign rather than be turned out, retired from court to another uncle, who was biſhop of Wincheſter. This good prelate prevailed upon his nephew to forſake the world and become a monk; after which he retired to a little cell built againſt the church-wall of Glaſtonbury. Here he ſlept, ſtudied, prayed, meditated, and ſometimes amuſed himſelf with forging ſeveral uſeful things in braſs and iron. One evening, as he was working very buſily at his forge, the devil, putting on the appearance of a man, thruſt his head in at the window of his cell, and aſked him to make ſomething or other for him. Dunſtan was ſo intent upon his work that he made no anſwer; on which the devil began to ſwear and talk obſcenely, which betrayed the lurking fiend. The holy blackſmith, putting up a ſecret ejaculation, pulled his tongs, which were red-hot, out of the fire, ſeized the devil with them by the noſe, and ſqueezed him with all his ſtrength; which made his infernal majeſty roar and ſcold at ſuch a rate, that he awakened and terrified all the people for many miles around. Thus far the legend.

Ridiculous as were theſe fictions, they ſerved, in thoſe times of ignorance, to procure Dunſtan a reputation which has been confirmed by the authority of ſeveral ſucceeding hiſtorians. It appears that this extraordinary perſon was recalled to court by king Edmund, A. D. 941; who beſtowed upon him the rich abbey of Glaſtonbury, which for his ſake he honoured with many peculiar privileges. He enjoyed a very high degree of the favour of this prince during his ſhort reign of ſix years; but he ſtood much higher in the favour of his brother and ſucceſſor king Edred, to whom he was confeſſor, chief confident, and prime miniſter. He employed all his influence during this period of court-favour in promoting the intereſt of the monks of the Benedictine order, to which he belonged, and of which he was a moſt active and zealous patron. Having the treaſures of theſe two princes, eſpecially of the laſt, very much at his command, he laviſhed them away in building and endowing monaſteries for theſe monks, becauſe almoſt all the old monaſteries were in the poſſeſſion of ſecular canons. Not contented with this, he perſuaded Edred (who was a bigotted valetudinary) to beſtow ſuch immenſe treaſures on the churches and monaſteries by his laſt will, that the crown was ſtripped of its moſt valuable poſſeſſions, and left in a ſtate of indigence. This conduct of Dunſtan, while he was in power, rendered him very odious to Edwi, who ſucceeded his uncle Edred A. D. 955; and his rude behaviour to himſelf, and his beloved queen Elgiva, raiſed the reſentment of that prince ſo high, that he deprived him of all his preferments, and drove him into exile *. The baniſhment of Dunſtan, the great patron, or (as Malmſbury calls him) the prince of monks, was a ſevere blow to that order, who were expelled from ſeveral monaſteries; which were made the impure ſtables (according to the ſame author) of the married clergy. But their ſufferings were not of long continuance. For Edgar, the younger brother of Edwi, having raiſed a ſucceſsful rebellion againſt his unhappy brother, and uſurped all his dominions on the north ſide of the river Thames, recalled Dunſtan, and gave him the biſhopric of Worceſter, A. D. 957. From this moment he was the chief confident and prime miniſter of king Edgar, who became ſole monarch of England A. D. 959, by the death of his elder brother Edwi. In the following year Dunſtan was raiſed to be archbiſhop of Canterbury; and being thus poſſeſſed of the primacy, and aſſured of the royal ſupport and aſſiſtance, he prepared to execute the grand deſign which he had long meditated, of compelling the ſecular canons to put away their wives and become monks; or of driving them out and introducing Benedictine monks in their room. With this view he procured the promotion of Oſwald to the ſee of Worceſter, and of Ethelwald to that of Wincheſter; two prelates who were monks themſelves, and animated with the moſt ardent zeal for the advancement of their order. And theſe three great champions of the order found means, by their arts and intrigues, in the courſe of a few years, to fill no fewer than 48 monaſteries with Benedictines. But on the death of Edgar in 975 they received a check. The ſufferings of the perſecuted canons had excited much compaſſion; and many of the nobility, who had been overawed by the power and zeal of the late king, now eſpouſed their cauſe and promoted their reſtoration. Elfere Duke of Mercia drove the monks by force out of all the monaſteries in that extenſive province, and brought back the canons, with their wives and children; while Elfwin Duke of Eaſt Anglia, and Brithnot Duke of Eſſex, raiſed their troops to protect the monks in theſe countries. To allay theſe commotions, ſeveral councils were held: in which Dunſtan was ſo hard puſhed by the ſecular canons and their friends, that he was obliged to practiſe ſome of his holy ſtratagems; and finally, by dint of miracles, overcame all oppoſition *.

St Dunſtan died A. D. 988, in the 64th year of his age, having held the biſhopric of London, together with the archbiſhopric of Canterbury, about 27 years. As this prelate was the great reſtorer and promoter of the monaſtic inſtitutions, the grateful monks, who were almoſt the only hiſtorians of thoſe dark ages, have loaded him with the moſt extravagant praiſes, and repreſented him as the greateſt wonder-worker and higheſt favourite of heaven that ever lived. To ſay nothing of his many conflicts with the devil, in which he often belaboured that enemy of mankind moſt ſeverely, the following ſhort ſtory, which is told with great exultation by his biographer Oſbern, will give the reader ſome idea of the aſtoniſhing impiety and impudence of thoſe monks, and of the no leſs aſtoniſhing blindneſs and credulity of thoſe unhappy times. "The moſt admirable, the moſt ineſtimable Father Dunſtan (ſays that author), whoſe perfections exceeded all human imagination, was admitted to behold the mother of God and his own mother in eternal glory: for before his death he was carried up into heaven, to be preſent at the nuptials of his own mother with the Eternal King, which were celebrated by the angels with the moſt ſweet and joyous ſongs. When the angels reproached him for his ſilence on this great occaſion, ſo honourable to his mother, he excuſed himſelf on account of his being unacquainted with thoſe ſweet and heavenly ſtrains; but being a little inſtructed by the angels, he broke out into this melodious ſong, O King and Ruler of nations," &c. It is unneceſſary to make any comment on this moſt ſhocking ſtory.

The violent and too ſucceſsful zeal of Dunſtan and his aſſociates, in promoting the building and endowing ſo great a number of houſes for the entertainment of uſeleſs monks and nuns, was very fatal to their country: for by this means a ſpirit of irrational unmanly ſuperſtition was diffuſed amongſt the people, which debaſed their minds and diverted them from nobler purſuits; and a very great proportion of the lands of England being put into hands who contributed nothing

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* See *England*, n° 57.

* See *Lond*,

thing to its defence, rendered it an eaſy prey, firſt to the inſulting Danes, and afterwards to the victorious Normans.

DUNUM, a Celtic term, denoting a hill or eminence, and which often concurs to form the names of towns, to ſignify their high ſituation, places of ſtrength or citadels, hills or eminences, being adapted to ſuch ſtructures. See DUN.

DUNUM (Ptolemy), a town of Ireland; now thought to be *Down* or *Down-Patrick*, in the county of Down. W. Long 5. 57. N. Lat. 54. 23.

DUO, in muſic, a ſong or compoſition, to be performed on two parts only, one ſung, the other played on an inſtrument, or by two voices.

DUO is alſo when two voices ſing different parts, as accompanied with a third, which is a thorough baſs. It is ſeldom that uniſons and octaves are uſed in duos, except at the beginning and end.

DUODECIMA, in muſic, is the twelfth or the fifth doubled.

DUODENUM. See ANATOMY, p. 727.

DUPIN (Lewis Ellis), a learned doctor of the Sorbonne, and one of the greateſt critics of his time, eſpecially in eccleſiaſtical matters, was born at Paris in 1657. When he publiſhed the firſt volume of his *Bibliotheque Univerſelle des Auteurs Eccleſiaſtiques*, in 1686, the liberty with which he treated ſome eccleſiaſtical writers, gave ſuch offence, that M. de Harlay, archbiſhop of Paris, obliged Dupin to retract many propoſitions, and ſuppreſſed the work. He was nevertheleſs ſuffered to continue it, by altering the title from *Bibliotheque Univerſelle*, to *Bibliotheque Nouvelle*. This great undertaking continued in ſeveral ſucceſſive volumes, though ſufficient to occupy the life of an ordinary man, did not hinder M. Dupin from obliging the world with ſeveral other works. He was a man of prodigious reading; and had an eaſy happy way of writing, with an uncommon talent at analyſing the works of an author; which makes his Eccleſiaſtical Bibliotheque ſo valuable. M. Dupin was profeſſor of philoſophy in the royal college; but was baniſhed ſome time from the chair to Chatelleraut, on account of the famous *Cas de Conſcience*; but was reſtored, and died in 1719.

DUPLE, among mathematicians, denotes the ratio of 2 to 1. Thus the ratio of 8 to 4 is duple, or as 2 to 1.

*Sub-DUPLE Ratio*, is juſt the reverſe of the former, or as 1 to 2. Such is 4 to 8, or 6 to 12.

DUPLICATE, among lawyers, denotes a copy of any deed, writing, or account. It is alſo uſed for the ſecond letters-patent, granted by the lord chancellor in a caſe wherein he had before done the ſame. Alſo a ſecond letter written and ſent to the ſame party and purpoſe as a former, for fear of the firſt's miſcarrying, is called a *duplicate*.

*DUPLICATE Proportion* or *Ratio*. See RATIO.

DUPLICATION, in general, ſignifies the doubling of any thing, or multiplying of it by 2: alſo the folding of any thing back again on itſelf.

DUPLICATURE, among anatomiſts, a term uſed to denote the folds of any membrane or veſſel: thus we ſay, the *duplicatures of the inteſtines, peritonæum*, &c.

DUPONDIUS, in antiquity, a weight of two pounds, or a money of the value of two aſſes. See AS.

As the as at firſt weighed a juſt pondo or libra, the dupondius then weighed two; and hence the name.

And though the weight of the as was afterwards diminiſhed, and of conſequence that of the dupondius alſo, yet they ſtill retained the denomination. See POUND and LIBRA.

DUPPA (Brian), a learned Engliſh biſhop born in 1589 at Lewiſham in Kent, of which place his father was then vicar. In 1634, he was inſtituted chancellor of the church at Sarum, and ſoon after made chaplain to Charles I. He was appointed tutor to Charles prince of Wales, and his brother James duke of York; was made biſhop of Chicheſter; and in 1641 tranſlated to Saliſbury, though the confuſions that followed deprived him of all benefit from his promotion. Charles I. held him in high eſteem, and he is ſaid to have aſſiſted the king in compoſing the *Eikon Baſilike*. On the Reſtoration he was made biſhop of Wincheſter, and lord high almoner; but died in 1662. He bequeathed large ſums to charitable purpoſes: and publiſhed a few ſermons, with other religious pieces.

DURANDUS (William), born at Puimoiſſion in Provence, in the 13th century, was one of the moſt knowing lawyers of his time. Pope Martin made him one of his nuncios, and then biſhop of Mende and Languedoc. His *Speculum Juris* gave him the name of *Speculator*; his ſecond piece was *Rationale divinorum officiorum*, containing eight books. He wrote ſeveral others.

DURANTA, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ*. The calyx is quinquefid, ſuperior; the berry tetraſpermous; the ſeeds bilocular.

DURATION, an idea we get by attending to the fleeting and perpetual periſhing parts of ſucceſſion. See METAPHYSICS.

DURATION, as marked by certain periods and meaſures, is what we moſt properly call *time*. See TIME.

*DURATION of Action*, according to Ariſtotle, is confined to a natural day in tragedy; but the epopea, according to the ſame critic, has no fixed time. See POETRY.

DURER (Albert), deſcended of an Hungarian family, and born at Nuremberg in 1471, was one of the beſt engravers and painters of his age. He was at the ſame time a man of letters and a philoſopher; and he was an intimate friend of Eraſmus, who reviſed ſome of the pieces which he publiſhed. He was a man of buſineſs alſo, and for many years the leading magiſtrate of Nuremberg. Though not the inventor, he was one of the firſt improvers of the art of engraving; and he bethought himſelf of working alſo in wood, for expedition, having an inexhauſtible fund of deſigns. In many of thoſe prints which he executed on copper, the engraving is elegant to a great degree. His *Hell-Scene* particularly, which was engraved in the year 1513, is as highly finiſhed a print as ever was engraved, and as happily executed. In his wooden prints too we are ſurpriſed to ſee ſo much meaning in ſo early a maſter; the heads ſo well marked, and every part ſo well executed.

cuted.—This artiſt ſeems to have underſtood the principles of deſign. His compoſition, too, is often pleaſing; and his drawing generally good. But he knows very little of the management of light; and ſtill leſs of grace: and yet his ideas are purer and more elegant than we could have ſuppoſed from the aukward archetypes which his country and education afforded. In a word, he was certainly a man of a very extenſive genius; and, as Vaſari remarks, would have been an extraordinary artiſt, if he had had an Italian inſtead of a German education. His prints are very numerous. They were much admired in his own life-time, and eagerly bought up; which put his wife, who was a teazing woman, upon urging him to ſpend more time upon engraving than he was inclined to do. He was rich; and choſe rather to practiſe his art as an amuſement than as a buſineſs. He died in the year 1527.

DURESSE, HARDSHIP, in law, is where a perſon is kept in priſon or reſtrained of his liberty, contrary to order of law; or is threatened to be killed, maimed, or beaten. In which caſe, if a perſon ſo in priſon, or in fear of ſuch threats, make any ſpecialty or obligation, by reaſon of ſuch impriſonment or threats, ſuch deed is void in law; and in an action brought on ſuch ſpecialty, the party may plead, that it was brought by dureſſe.

D'URFEY (Thomas), an eminent Engliſh ſatyriſt and ſongſter, whoſe name, though as well known as that of any writer extant, yet there are very few particulars of his life to be collected. He was born in Devonſhire; but when, where, or of what family, are all uncertain. He was bred to the law, which he forſook for the more agreeable employment of writing plays and ſongs; and the latter he had ſo happy a talent both of writing and ſinging, that he received many favours from perſons of quality on that account. Even crowned heads did not diſdain his company. The writer of the Guardian, N° 67. tells us, he remembered to have ſeen Charles II. leaning on Tom D'Urfey's ſhoulder more than once, humming over a ſong with him. This indeed was not extraordinary in ſo merry a monarch; but even the phlegmatic king William could relax his muſcles on hearing him ſing. He was certainly by all accounts a cheerful, honeſt, good-natured man: but as this character does not include prudence, D'Urfey grew poor as he grew old; and prevailing on the managers of the playhouſe to act his comedy of the *Plotting Siſters* for his benefit, Mr Addiſon wrote the abovementioned paper in the Guardian, with another, N° 82. repreſenting him in a good humoured light, to procure him a full houſe. He died very old, in 1723.

DURHAM (biſhopric of), one of the counties of England. Before the arrival of the Romans it was included in the Britiſh principality of the Brigantes, and after their arrival made part of the province of Maxima Cæſarienſis. During the Heptarchy it made part of the kingdom of Northumberland, the 5th eſtabliſhed, which began in 547, and ended in 827, having been governed by 31 kings. It was not mentioned by Alfred in his diviſion of counties, being at that time conſidered as a part of Yorkſhire. At preſent it is included in the northern circuit, in the province of York; and is a dioceſe and principality under the government of its own biſhop, being a county palatine, the ſecond in rank, and the richeſt in England. It is bounded on the north by Northumberland, on the ſouth by Yorkſhire, on the eaſt by the North Sea, and on the weſt by Cumberland. It is 39 miles long, 35 broad, and 107 in circumference; containing 410,000 ſquare acres, or 758 ſquare miles; with 97,000 inhabitants, 80 pariſhes, 21 vicarages, one city (Durham), and 9 market-towns, *viz.* Stockton, Sunderland, Barnard-Caſtle, Darlington, Stanhope, Hartlepool, Aukland, Staindrop, and Marwood; beſides 223 villages. It is divided into 4 wards, ſends 4 members to parliament, pays three portions of the land-tax, and provides 400 of the national militia. It has 21 parks, 4 caſtles, and 20 bridges, with the rivers Tees, Tine, Were, Tame, Lune, Darwent, Gauntleſs, Skern, &c. The Lune and Teeſdale foreſts. Its principal products are lead, coals, iron, corn, muſtard, ſalt, glaſs, fine ale, with excellent butter and ſalmon. The ſoil is various; the ſouth is rich, but the weſtern parts rocky and mooriſh.

Durham, as already obſerved, is a county palatine, governed by the biſhop, who had formerly great prerogatives. He had power to create barons, appoint judges, convoke parliaments, raiſe taxes, and coin money. The courts of juſtice were kept in his name; and he granted pardons for treſpaſſes, alienations, rapes, murders, and felonies of every denomination. He erected corporations, granted markets and fairs, created officers by patent, was lord admiral of the ſeas and waters within the county palatine: great part of the lands were held of the ſee *in capite.* In a word, he exerciſed all the power and juriſdiction of a ſovereign prince. How and at what period theſe prerogatives were obtained, it is not eaſy to determine. Malmſbury ſays, the lands were granted by king Alfred, who likewiſe made the church a ſanctuary for criminals. This ſee was anciently called the *patrimony of St Cuthbert*, who had been biſhop of Landisfarne or Holy Iſland near Berwick. His bones being transferred to Durham, were long eſteemed as precious relics; and the people of the county conſidered themſelves as Halwerk men, exempted from all other but holy work, that is, the defence of St Cuthbert's body. Certain it is, they pretended to hold their lands by this tenure; and refuſed to ſerve out of the county either for the king or biſhop: but king Edward I. broke through theſe privileges, and curtailed the prerogatives of the biſhops, which were ſtill farther abridged by Henry VIII. Nevertheleſs, the biſhop is ſtill earl of Sadberg, a place in this county which he holds by barony. He is ſheriff paramount, and appoints his own deputy, who makes up his audit to him, inſtead of accounting to the exchequer. He has all the forfeitures upon outlawries: and he and his temporal chancellor act as juſtices of the peace for the county palatine, which comprehends Creke in Yorkſhire, Bedlington, Northam, and Holy Iſland, in Northumberland, the inhabitants of theſe places having the benefit of the courts at Durham. The judges of aſſize, and all the officers of the court, have ſtill their ancient ſalaries from the biſhop; and he conſtitutes the ſtanding officers by his letters patent. He has the power of preſiding in perſon in any of the courts of judicature. Even when judgment of blood am.

is given, this prelate may ſit in court in his purple robes, though the canons forbid any clergyman to be preſent in ſuch caſes: hence the old ſaying, *Solum Dunelmenſe ſtola jus dicet et enſe.* It was not till the reign of Charles II. that the biſhopric ſent repreſentatives to parliament.

Durham, the capital of the above mentioned county, is ſituated in W. Long. 1. 14. N. Lat. 54. 50. It ſtands on a hill almoſt ſurrounded by the river Were; and is conſiderable for its extent and the number of its inhabitants, as well as for being the ſee and ſeat of the biſhop, who is lord paramount. It ſtands about 280 miles north from London; being remarkable for the ſalubrity of its air, and the abundance and cheapneſs of its proviſions. Theſe circumſtances have induced a great deal of good company to take up their reſidence at Durham, which is ſtill further animated by the preſence and court of the biſhop and his clergy. The town is ſaid to have been built about 70 years before the Norman conqueſt, on occaſion of bringing hither the body of St Cuthbert. It was firſt incorporated by king Richard I. but queen Elizabeth extended its privileges. At length, in the year 1684, it obtained a charter; in conſequence of which, it is now governed by a mayor, 12 aldermen, 12 common council men, with a recorder, and inferior officers. Theſe can hold a court-leet and court-baron within the city; but under the ſtyle of the biſhop, who as count palatine appoints a judge, ſteward, ſheriffs, and other inferior magiſtrates. The mayor and aldermen alſo keep a *pie pouldres* court at their fairs, and pay a yearly toll to the biſhop. They have a weekly market on Saturday, and three annual fairs. Durham is about a mile in length, and as much in breadth, reſembling the figure of a crab, the market-place exhibiting the body, and the claws being repreſented by the ſtreets, which bend according to the courſe of the river, that almoſt ſurrounds one part of the city. They are, moreover, dark and narrow; and ſome of them lying on the acclivity of a ſteep hill, are very difficult and dangerous to wheel-carriages. The houſes are in general ſtrong built, but neither light nor elegant. The moſt remarkable edifices are the cathedral with ſix other churches, three ſtanding in the city, and as many in the ſuburbs; the college; the caſtle, or biſhop's palace; the tolbooth near St Nicholas's church; the croſs and conduit in the market-place; with two bridges over the Elvet. The cathedral was begun by biſhop Carilepho in the 11th century. It is a large, magnificent, Gothic ſtructure, 411 feet long, and 80 in breadth, having a croſs aile in the middle 170 feet in length, and two ſmaller ailes at each end. On the ſouth-ſide is a fine cloiſter; on the eaſt, the old library, the chapter-houſe, and part of the deanery; on the weſt, the dormitory, under which is the treaſury and a chantry; and on the weſt ſide is the new library, an elegant building begun by dean Sudbury about 70 years ago, on the ſpot where ſtood the old refectory of the convent. The middle tower of the cathedral is 212 feet high. The whole building is arched and ſupported by huge pillars. Several of the windows are curiouſly painted; and there is a handſome ſcreen at the entrance into the choir. Sixteen biſhops are interred in the chapter-houſe, which is 75 feet long and 33 broad, arched over-head, with a magnificent ſeat at the upper end for the inſtalment of the biſhops. The conſiſtory is kept in the chapel or weſt aile called *Galilee*, which was built by biſhop Pudſey, and had formerly 16 altars for women, as they were not allowed to advance farther than the line of marble by the ſide of the font; here likewiſe are depoſited the bones of the venerable Bede, whoſe elogium is written on an old parchment ſcroll that hangs over his tomb. The long croſs aile, at the extremity of the church, was formerly diſtinguiſhed by nine altars, four to the north, and four to the ſouth, and the moſt magnificent in the middle dedicated to the patron St Cuthbert, whoſe rich ſhrine was in this quarter, formerly much frequented by pilgrims. The church is poſſeſſed of ſome old records relating to the affairs of Scotland, the kings of which were great benefactors to this cathedral. The ornaments here uſed for adminiſtering the divine offices, are ſaid to be richer than thoſe of any other cathedral in England. Before the reformation, it was diſtinguiſhed by the name *Eccleſia ſanctæ Mariæ et ſancti Cuthberti*; but it obtained the appellation of *Eccleſia cathedralis Chriſti et beatæ Mariæ*, in the reign of Henry VIII. who endowed the deanery with 12 prebendaries, 12 minor canons, a deacon, ſub-deacon, 16 lay ſinging men, a ſchoolmaſter and uſher, a maſter of the choir, a divinity reader, eight alms-men, 18 ſcholars, 10 choiriſters, two vergers, two porters, two cooks, two butlers, and two ſacriſtans. On the ſouth-ſide of the cathedral is the college; a ſpacious court formed by the houſes of the prebendaries, who are richly endowed and extremely well lodged. Above the college-gate, at the eaſt end, is the exchequer; and at the weſt, a large hall for entertaining ſtrangers, with the granary and other offices of the convent. The college-ſchool, with the maſter's houſe, ſtands on the north ſide of the cathedral. Between the churchyard and caſtle, is an open area called the *palace green*; at the weſt end of which ſtands the ſhire-hall, where the aſſizes and ſeſſions are held for the county. Hard by is the library built by biſhop Coſin; together with the exchequer raiſed by biſhop Nevil, in which are kept the offices belonging to the county-palatine court. There is an hoſpital on the eaſt, endowed by biſhop Coſin, and at each end of it are two ſchools founded by biſhop Langley. On the north, is the caſtle built by William the Conqueror, and afterwards converted into the biſhop's palace, the outward gate of which is at preſent the county-goal.

Durham.

The city conſiſts of three manors; the biſhop's manor, containing the city liberties and the bailey, held of him by the ſervice of caſtle-guard; the manor of the dean and chapter, conſiſting of the Elvet's croſs gate, ſouth-gate ſtreet; and the manor of Gilligate, formerly belonging to the diſſolved hoſpital of Kepyar in this neighbourhood, but granted by Edward VI. to John Cockburn, lord of Ormiſtoun, and late in the poſſeſſion of John Tempeſt, Eſq.

The biſhopric of Durham is deemed the richeſt biſhopric in the kingdom; and the prebends are frequently ſtyled the Golden Prebends of Durham. The dioceſe contains the whole counties of Durham and Northumberland, except the juriſdiction of Hexham in the latter. It hath alſo one pariſh in the county of Cumberland: making in the whole 135 pariſhes, whereof 87 are impropriate. The ſee is valued in the king's books at L. 2821 : 1 : 5¼, but is computed to

be

be worth annually L. 8700. The clergy's tenths amount to L. 385 : 5 : 6½. It has two archdeacons, viz. of Durham and Northumberland. This ſee hath given to the church of Rome eight ſaints and one cardinal; and to the Engliſh nation one lord chief juſtice, five lord chancellors, three lord treaſurers, one principal ſecretary of ſtate, one chancellor to the univerſity of Oxford, and two maſters of the rolls.

In the neighbourhood of this city is Nevil's croſs, famous for the battle fought in the year 1346, againſt David II. king of Scotland, who was defeated and taken.

DURIO, in botany: A genus of the polyandria order, belonging to the polyadelphia claſs of plants. The calyx is a monophyllous perianthium; the corolla has five petals growing to the calyx; the ſtamina are conjoined in five bodies; the germ is roundiſh; the ſtyle briſtly, the length of the ſtamina. The fruit is a roundiſh apple every where muricated; the ſeeds have a mucous orilla.

DURNIUM, or DURNOVARIA, a town of the Durotriges in Britain. Now *Dorcheſter*, the capital of Dorſetſhire, on the Frome.

DUROBRIVÆ (anc. geog.), a town of the Catyeuchlani in Britain. Now in ruins, which lie on the Nen, between Caſter and Dornford, in Northamptonſhire, on the borders of Huntingdon.

DUROBRIVÆ, or *Durocobrivæ*, a town of the Trinobantes, in Britain; whoſe ruins are ſituated between Flamſtead and Redburn, in Hertfordſhire.

DUROBRIVIS, 25 miles to the weſt of Durovernum, or Canterbury; from which it appears to be Rocheſter town, confirmed by the charter of foundation of the church, in which it is called *Durobrevis*.

DUROCASES, DUROCASSIUM, DUROCASSÆ, and DUROCASSES, a town of the Carnutes, in Gallia Celtica; now Dreux. See DRUIDÆ.

DUROCORNOVIUM (anc. geog.), a town of Britain; now *Cirenceſter*, in Glouceſterſhire (Camden), called *Corinium* by Ptolemy.

DUROCORTORUM, or DURICORTORA, a town of the Rhemi in Belgica; now *Rheims* in Champaign. E. Long. 4. N. Lat. 49. 20.

DUROIA, in botany: A genus of the monogynia order, belonging to the hexandria claſs of plants. The calyx above is cylindrical and loped; the border ſix-parted; there are no filaments; the fruit a hiſpid apple.

DUROLENUM, a town of the Cantii in Britain; now *Lenham*, in Kent (Camden); *Charing* (Talbot).

DUROLITUM, a town of the Trinobantes; now *Leiton*, on the Ley, in Eſſex (Camden).

DUROTRIGES, an ancient Britiſh nation, ſeated in that part of the country which is now called *Dorſetſhire*. Their name is derived from the two Britiſh words *Dur* "water," and *Trigo* "to dwell;" and it is no leſs evident that they got their name from the ſituation of their country, which lies along the ſea-coaſt. It is not very certain whether the Durotriges formed an independent ſtate under a prince of their own, or were united with their neighbours the Danmonii; as they were reduced by Veſpaſian under the dominion of the Romans, at the ſame time, and with the ſame eaſe, and never revolted. The peaceable diſpoſition of the inhabitants was probably the reaſon that the Romans had ſo few towns, forts, and garriſons, in this pleaſant country. Dorcheſter, its preſent capital, ſeems to have been a Roman city of ſome conſideration, though our antiquaries are not agreed about its Roman name. It is moſt probable that it was the Durnovaria in the 12th Iter of Antoninus. Many Roman coins have been found at Dorcheſter; the military way, called *Jeening-Street*, paſſed through it; and ſome veſtiges of the ancient ſtone wall with which it was ſurrounded, and of the amphitheatre with which it was adorned, are ſtill viſible. The country of the Durotriges was included in the Roman province called *Flavia Cæſarienſis*, and governed by the preſident of that province, as long as the Romans kept any footing in theſe parts.

DURY (John), a Scots divine, who travelled much, and laboured with great zeal to reunite the Lutherans with the Calviniſts. His diſcouragements in this ſcheme ſtarted another ſtill more impracticable; and this was to reunite all Chriſtians by means of a new explication of the Apocalypſe, which he publiſhed at Francfort in 1675. He enjoyed then a comfortable retreat in the country of Heſſe; but the time of his death is unknown: his letter to Peter du Moulin concerning the ſtate of the churches of England, Scotland, and Ireland, was printed at London in 1658, by the care of du Moulin, and is eſteemed to be curious.

DUSSELDORP, a city of Weſtphalia in Germany, and capital of the duchy of Berg. It is ſituated at the conflux of the river Duſſel with the Rhine, in E. Long, 6. 20. N. Lat. 51. 15.

DUTCHY. See DUCHY.

DUTY, in general, denotes any thing that one is obliged to perform.

DUTY, in a moral ſenſe. See *MORAL Philoſophy*.

DUTY, in polity and commerce, ſignifies the impoſt laid on merchandizes, at importation or exportation, commonly called the duties of cuſtoms; alſo the taxes of exciſe, ſtamp-duties, &c. See CUSTOMS, EXCISE, &c.

The principle on which all duties and cuſtoms ſhould be laid on foreign merchandizes which are imported into theſe kingdoms, are ſuch as tend to cement a mutual friendſhip and traffic between one nation and another; and therefore due care ſhould be taken in the laying of them, that they may anſwer ſo good an end, and be reciprocal in both countries: they ſhould be ſo laid as to make the exports of this nation at leaſt equal to our imports from thoſe nations wherewith we trade, ſo that a balance in money ſhould not be iſſued out of Great Britain, to pay for the goods and merchandizes of other countries; to the end that no greater number of our landholders and manufacturers ſhould be deprived of their revenues ariſing from the product of the lands, and the labour of the people, by foreign importations, than are maintained by exportations to ſuch countries. Theſe are the national principles on which all our treaties of commerce with other countries ought to be grounded.

DUTY, in the military art, is the exerciſe of thoſe functions that belong to a ſoldier: with this diſtinction, that mounting guard and the like, where there is no enemy directly to be engaged, is called duty; but their marching to meet and fight an enemy is called going on ſervice.

DUUMVIRATE, the office or dignity of the duumviri. See the next article.

The duumvirate laſted till the year of Rome 388, when it was changed into a decemvirate.

DUUMVIRI, in Roman antiquity, a general appellation given to magiſtrates, commiſſioners, and officers, where two were joined together in the ſame functions.

*Duumviri Capitales* were the judges in criminal cauſes: from their ſentence it was lawful to appeal to the people, who only had the power of condemning a citizen to death. Theſe judges were taken from the body of the decuriones; they had great power and authority, were members of the public council, and had two lictors to walk before them.

*Duumviri Municipales*, were two magiſtrates in ſome cities of the empire, anſwering to what the conſuls were at Rome: they were choſen out of the body of the decuriones; their office laſted commonly five years, upon which account they were frequently termed *quinquinales magiſtratus*. Their juriſdiction was of great extent: they had officers who walked before them, carrying a ſmall ſwitch in their hands; and ſome of them aſſumed the privilege of having lictors, carrying axes and the faſces, or bundles of rods, before them.

*Duumviri Navales*, were the commiſſaries of the fleet, firſt created at the requeſt of M. Decius, tribune of the people, in the time of the war with the Samnites. The duty of their office conſiſted in giving orders for the fitting of ſhips, and giving their commiſſions to the marine officers, &c.

*Duumviri Sacrorum*, were magiſtrates created by Tarquinius Superbus, for the performance of the ſacrifices, and keeping of the ſibyls books. They were choſen from among the patricians, and held their office for life: they were exempted from ſerving in the wars, and from the offices impoſed on the other citizens, and without them the oracles of the ſibyls could not be conſulted.

DUYVELAND, or DIVELAND, one of the iſlands of Zealand, in the United Provinces, lying eaſtward of Schonen, from which it is only ſeparated by a narrow channel.

DWAL, in heraldry, the herb nightſhade, uſed by ſuch as blazon with flowers and herbs, inſtead of metals and colours, for ſable or black.

DWARF, in general, an appellation given to things greatly inferior in ſize to that which is uſual in their ſeveral kinds: thus there are dwarfs of the human ſpecies, dwarf-dogs, dwarf-trees, &c.

The Romans were paſſionately fond of dwarfs, whom they called *nani* or *nanæ*, inſomuch that they often uſed artificial methods to prevent the growth of boys deſigned for dwarfs, by incloſing them in boxes, or by the uſe of tight bandages. Auguſtus's niece, Julia, was extremely fond of a dwarf called *Sonopas*, who was only two feet and an hand-breadth high.—We have many other accounts of human dwarfs, but moſt of them deformed in ſome way or other beſides the ſmallneſs of their ſize. Many relations alſo concerning dwarfs we muſt neceſſarily look upon to be fabulous, as well as thoſe concerning giants.—The following hiſtory, however, which we have reaſon to look upon as authentic, is too remarkable not to be acceptable to the generality of our readers.

Dwarf.

Jeffery Hudſon, the famous Engliſh dwarf, was born at Oakham in Rutlandſhire in 1619; and about the age of ſeven or eight, being then but 18 inches high, was retained in the ſervice of the duke of Buckingham, who reſided at Burleigh on the Hill. Soon after the marriage of Charles I. the king and queen being entertained at Burleigh, little Jeffery was ſerved up to table in a cold pye, and preſented by the ducheſs to the queen, who kept him as her dwarf. From 7 years of age till 30, he never grew taller; but after 30, he ſhot up to three feet nine inches, and there fixed. Jeffery became a conſiderable part of the entertainment of the court. Sir William Davenant wrote a poem called *Jeffreidos*, on a battle between him and a turkey-cock; and in 1638, was publiſhed a very ſmall book, called the *New Year's Gift*, preſented at court by the lady Parvula to the lord Minimus (commonly called *Little Jeffery*) her majeſty's ſervant, &c. written by Microphilus, with a little print of Jeffery prefixed. Before this period, Jeffery was employed on a negociation of great importance: he was ſent to France to fetch a midwife for the queen; and on his return with this gentlewoman, and her majeſty's dancing-maſter, and many rich preſents to the queen from her mother Mary de Medicis, he was taken by the Dunkirkers. Jeffery, thus made of conſequence, grew to think himſelf really ſo. He had borne with little temper the teazing of the courtiers and domeſtics, and had many ſquabbles with the king's gigantic porter. At laſt, being provoked by Mr Crofts, a young gentleman of family, a challenge enſued: and Mr Crofts coming to the rendezvous armed only with a ſquirt, the little creature was ſo enraged, that a real duel enſued; and the appointment being on horſeback with piſtols, to put them more on a level, Jeffery, with the firſt fire, ſhot his antagoniſt dead. This happened in France, whither he had attended his miſtreſs in the troubles. He was again taken priſoner by a Turkiſh rover, and ſold into Barbary. He probably did not remain long in ſlavery: for at the beginning of the civil war, he was made a captain in the royal army; and in 1644 attended the queen to France, where he remained till the Reſtoration. At laſt, upon ſuſpicion of his being privy to the Popiſh plot, he was taken up in 1682, and confined in the Gatehouſe, Weſtminſter, where he ended his life, in the 63d year of his age.

In the Memoirs of the Royal Academy of Sciences, a relation is given by the Count de Treſſau, of a dwarf called *Bebe*, kept by the late Staniſlaus king of Poland, and who died in 1764 at the age of 23, when he meaſured only 33 inches. At the time of his birth, he meaſured only between eight and nine inches. Diminutive as were his dimenſions, his reaſoning faculties were not leſs ſcanty; appearing indeed not to have been ſuperior to thoſe of a well-taught pointer: but that the ſize and ſtrength of the intellectual powers are not affected by the diminutiveneſs or tenuity of the corporeal organs, is evident from a ſtill more ſtriking inſtance of littleneſs, given us by the ſame nobleman, in the perſon of Monſieur Borulawſki, a Poliſh gentleman, whom he ſaw at Luneville, who has ſince been at Paris, and who at the age of 22 meaſured only 28 inches. This miniature of a man, conſidering him only as to his bodily dimenſions, appears a giant with regard to his mental powers and attainments. He is deſcribed by the count as poſſeſſing all the graces of wit, united with a ſound judgment and an excellent memory ; ſo that we may with juſtice ſay of M. Borulawſki, in the words of Seneca, and nearly in the order in which he has uſed them, "*Poſſe ingenium fortiſſimum ac beatiſſimum ſub quolibet corpuſculo latere.*" Epiſt. 66.

Count Borulawſki was the ſon of a Poliſh nobleman attached to the fortunes of king Staniſlaus, who loſt his property in conſequence of that attachment, and who had ſix children, three dwarfs, and three well-grown. What is ſingular enough, they were born alternately, a big one and a little one, though both parents were of the common ſize. The little count's youngeſt ſiſter was much leſs than him, but died at the age of 23. The count continued to grow till he was about 30, and has at preſent attained his 51ſt year, and the height of three feet two inches. He never experienced any ſickneſs, but lived in a polite and affluent manner under the patronage of a lady, a friend of the family, till love at the age of 41 intruded into his little peaceful boſom, and involved him in matrimony, care, and perplexity. The lady he choſe was of his own country, but of French extraction, and the middle ſize. They have three children, all girls, and none of them likely to be dwarfs. To provide for a family now became an object big with difficulty, requiring all the exertion of his powers (which could promiſe but little) and his talents, of which muſic alone afforded any view of profit. He plays extremely well upon the guittar : and by having concerts in ſeveral of the principal cities in Germany, he raiſed temporary ſupplies. At Vienna he was perſuaded to turn his thoughts to England, where it was believed the public curioſity might in a little time benefit him ſufficiently to enable him to live independent in ſo cheap a country as Poland. He was furniſhed by very reſpectable friends with recommendations to ſeveral of the moſt diſtinguiſhed characters in this kingdom, as the ducheſs of Devonſhire, Rutland, &c. &c. whoſe kind patronage he is not backward to acknowledge. He was adviſed to let himſelf be ſeen as a curioſity, and the price of admiſſion was fixed at a guinea. The number of his viſitors, of courſe, was not very great. After a pretty long ſtay in London he went to Bath and Briſtol ; viſited Dublin and ſome other parts of Ireland ; whence he returned by way of Liverpool, Mancheſter, and Birmingham, to London. He alſo viſited Edinburgh and ſome other towns of Scotland. In every place he acquired a number of friends. In reality, the eaſe and politeneſs of his manners and addreſs pleaſe no leſs than the diminutive, yet elegant, proportions of his figure aſtoniſh thoſe who viſit him. His perſon is pleaſing and graceful, and his look manly and noble. He ſpeaks French fluently, and Engliſh tolerably. He is remarkably lively and cheerful, though fited for the moſt ſerious and rational converſation. Such is this wonderful little man—an object of curioſity really worthy the attention of the philoſopher, the man of taſte, and the anatomiſt. His life has been publiſhed, written by himſelf.

**DWINA**, the name of two large rivers; one of which riſes in Lithuania, and, dividing Livonia from Courland, falls into the Baltic Sea a little below Riga: the other gives name to the province of Dwina in Ruſſia, diſcharging itſelf into the White Sea a little below Archangel.

**DYCK.** See VANDYCK.

**DYE**, in architecture, any ſquare body, as the trunk or notched part of a pedeſtal : or it is the middle of the pedeſtal, or that part included between the baſe and the corniche ; ſo called becauſe it is often made in the form of a cube or dye. See ARCHITECTURE, n° 61.

**DYER**, a perſon who profeſſes the art of dyeing all manner of colours. See DYEING.

**DYER** (Sir James), an eminent Engliſh lawyer, chief judge of the court of common pleas in the reign of Queen Elizabeth. He died in 1581 ; and about 20 years after was publiſhed his large collection of Reports, which have been highly eſteemed for their ſuccinctneſs and ſolidity. He alſo left other writings behind him relative to his profeſſion.

**DYER** (John), the ſon of Robert Dyer, Eſq; a Welſh ſolicitor of great capacity, was born in 1700. He paſſed through Weſtminſter-ſchool under the care of Dr Freind, and was then called home to be inſtructed in his father's profeſſion. His genius, however, led him a different way ; for beſides his early taſte for poetry, having a paſſion no leſs ſtrong for the arts of deſign, he determined to make painting his profeſſion. With this view, having ſtudied a while under his maſter, he became, as he tells his friend, an itinerant painter, and wandered about South Wales and the parts adjacent ; and about 1727 printed Grongar Hill. Being probably unſatisfied with his own proficiency, he made the tour of Italy ; where, beſides the uſual ſtudy of the remains of antiquity, and the works of the great maſters, he frequently ſpent whole days in the country about Rome and Florence, ſketching thoſe pictureſque proſpects with facility and ſpirit. Images from hence naturally transferred themſelves into his poetical compoſitions : the principal beauties of The Ruins of Rome are perhaps of this kind ; and the various landſcapes in The Fleece have been particularly admired. On his return to England, he publiſhed The Ruins of Rome, 1740 ; but ſoon found that he could not reliſh a town-life, nor ſubmit to the aſſiduity required in his profeſſion. As his turn of mind was rather ſerious, and his conduct and behaviour always irreproachable, he was adviſed by his friends to enter into holy orders ; and it is preſumed, though his education had not been regular, that he found no difficulty in obtaining them. He was ordained by the biſhop of Lincoln, and had a law degree conferred on him.

About the ſame time he married a lady of Coleſhill named Enſor ; "whoſe grandmother (ſays he) was a Shakeſpeare, deſcended from a brother of every body's Shakeſpeare." His eccleſiaſtical proviſion was a long time but ſlender. His firſt patron, Mr Harper, gave him, in 1741, Calthorp in Leiceſterſhire, of 80 l. a-year, on which he lived ten years ; and in April 1757 exchanged it for Belchford in Lincolnſhire, of 75 l. which was given him by lord chancellor Hardwicke, on the recommendation of a friend to virtue and the muſes. His condition now began to mend. In 1752, Sir John Heathcote gave him Coningſby, of 140 l. a-year ; and in 1756, when he was LL. B. without any ſolicitation of his own, obtained for him from the chancellor Kirby

Ier. on Bane, of 110 l. In 1757, he publiſhed The Fleece, his greateſt poetical work; of which Dr Johnſon relates this ludicrous ſtory. Dodſley the bookſeller was one day mentioning it to a critical viſitor, with more expectation of ſucceſs than the other could eaſily admit. In the converſation the author's age was aſked; and being repreſented as advanced in life, "He will (ſaid the critic) be buried in woollen." He did not indeed long outlive that publication, nor long enjoy the increaſe of his preferments; for a conſumptive diſorder, with which he had long ſtruggled, carried him off at length in 1758.

Dyer's Weed.

Mr Dyer's character as a writer has been fixed by three poems, Grongar Hill, The Ruins of Rome, and The Fleece; wherein a poetical imagination perfectly original, a natural ſimplicity connected with and often productive of the true ſublime, and the warmeſt ſentiments of benevolence and virtue, have been univerſally obſerved and admired. Theſe pieces were put out ſeparately in his lifetime: but after his death, they were collected and publiſhed in one volume 8vo, 1761; with a ſhort account of himſelf prefixed.

*Dyer's Weed*, in botany. See Reseda.

# DYEING,

In the utmoſt latitude of the word, may be defined, The art of tingeing cloth, ſtuff, or other matter, with a permanent colour, which penetrates the ſubſtance thereof.—It is, however, commonly reſtrained to the art of tingeing ſilk, wool, cotton, and linen, with different colours; and, as ſuch, is practiſed as a trade by thoſe who do not meddle with any of the other branches, as ſtaining of leather, &c.

uity art. The dyeing art is of great antiquity; as appears from the traces of it in the oldeſt ſacred as well as profane writers. The honour of the invention is attributed to the Tyrians; though what leſſens the merit of it is, that it is ſaid to have owed its riſe to chance. The juices of certain fruits, leaves, &c. accidentally cruſhed, are ſuppoſed to have furniſhed the firſt hint: Pliny aſſures us, that even in his time the Gauls made uſe of no other dyes. It is added, that coloured earths and minerals, waſhed and ſoaked with rain, gave the next dyeing materials.—But purple, an animal juice found in a ſhell-fiſh called *murex* *, *conchylium*, and *purpura*, ſeems from hiſtory to have been prior to any of them. This indeed was reſerved for the uſe of kings and princes; private perſons were forbidden by law to wear the leaſt ſcrap of it. The diſcovery of its tingeing quality is ſaid to have been taken from a dog, which having caught one of the purple fiſhes among the rocks, and eaten it up, ſtained his mouth and beard with the precious liquor; which ſtruck the fancy of a Tyrian nymph ſo ſtrongly, that ſhe refuſed her lover Hercules any favours till he had brought her a mantle of the ſame colour.

* *Mu-*

Pliny ſeems to aſcribe the invention of the art of dyeing wool to the Lydians of Sardis: *Inficere lanas Sardibus Lydi;* where the word *incipere* muſt be underſtood. But a modern critic ſuſpects a falſe reading here; and, not without reaſon, for *Lydi* ſubſtitutes *Lydda*, the name of a city on the coaſt of Phenicia, where the chief mart of the purple dye was.

After the Phenicians, the Sardinians ſeem to have arrived at the greateſt perfection in the dyeing art; inſomuch that βαμμα Σαρδινιακον, *Sardinian dye*, paſſed into a proverb among the Greeks. Till the time of Alexander, we find no other ſort of dye in uſe among the Greeks but purple and ſcarlet.—It was under the ſucceſſors of that monarch that theſe people applied themſelves to the other colours; and invented, or at leaſt perfected, blue, yellow, green, &c. For the ancient purple, it has been long loſt; but the perfection to which the moderns have carried the other colours, abundantly indemnifies them of the loſs. It is ſtill, however, greatly to be doubted whether the permanency of the modern colours at all equals that of the ancient ones; though it is certain that the former greatly exceed them in brightneſs.

## Sect. I. *Theory of Dyeing.*

2
Salts the only means of fixing colours.

Before we can enter into any conſideration of the true theory of dyeing, it is neceſſary to make the following obſervation concerning the practice, namely, That ſalts are almoſt the only means we are acquainted with by which any colouring ſubſtance can be made to fix itſelf upon thoſe matters which are the common ſubjects of dyeing. A ſolution of cochineal, for inſtance, will of itſelf impart no permanent colour to a piece of woollen cloth put into it. The red colour of the cochineal will indeed ſtain the cloth while it remains immerſed in the ſolution; but as ſoon as it is taken out and waſhed, this temporary ſtain will immediately vaniſh, and the cloth become as white as before. If now the cloth is dipped in the ſolution of any ſaline ſubſtance, alkalies alone excepted, and then immerſed in the ſolution of cochineal for ſome time, it will come out permanently coloured; nor will the colour be diſcharged even by waſhing with ſoap and water. If a quantity of ſalt is added to the ſolution of cochineal, and the cloth put in without being impregnated with any ſaline ſubſtance, the effect will be the ſame; the cloth will come out coloured; only in this laſt caſe, it muſt be well dried before waſhing it with ſoap, or moſt of the colour will be diſcharged.

3
They operate by coagulation.

By comparing this with what is delivered under the article *Colour-Making*, n 13, 14. we ſhall be able to form a pretty rational theory of dyeing. It is there remarked, that a ſaline ſubſtance (ſolution of tin in aqua regia) had a ſurpriſing power of coagulating the colouring matter of certain ſolutions, ſuch as cochineal, Brazil-wood, logwood, &c. If therefore a piece of cloth is previouſly impregnated with this ſolution, and put into the colouring one, it is plain that ſome part of the colouring matter will be coagulated by the ſolution remaining in the cloth, in the very ſame manner that it would have been if a ſmall quantity of the ſaline ſolution had been poured into the other. The cloth therefore will take up a part of the colouring matter, which cannot be diſcharged but by entirely diſcharging the ſolution of tin. This, however, ſeems to unite itſelf with the cloth very firmly, ſo that ſcarce a particle of colour will be diſcharged by waſhing in plain water, or even with ſoap; nor can the whole be taken out without boiling the cloth in a ſolution of fixed alkali.

Though ſolution of tin produces this coagulation in the moſt remarkable manner, it is not to be doubted that the ſame power is poſſeſſed in ſome degree by moſt of the neutrals and imperfect ſalts. Alum poſſeſſes it very conſiderably, though not ſo much as ſolution of tin; and hence that ſalt is very much uſed in dyeing, as well as ſugar of lead, which alſo has a very ſtrong power of coagulation. The proceſs of dyeing, therefore, ſeems to be moſt analogous to that of the coagulation or curdling of milk. Before it has ſuffered this change, the milk is eaſily miſcible with water; but after it is once coagulated, the curd, or caſeous part, is very difficultly ſoluble in any liquid whatever. In like manner, the colouring matter in the ſolution of cochineal, before the cloth is put in, is eaſily ſoluble in water, and may be diffuſed through any quantity of fluid: but no ſooner is the cloth dipped in it, than the ſaline ſubſtance contained in the cloth coagulates that part of the colouring matter which lies in immediate contact with it; and as all the fluid ſucceſſively comes into contact with it, the whole of the colour is by degrees coagulated and depoſited on the cloth.

4
Hypotheſes concerning the adheſion of the colour.

To account for the ſtrong adheſion of the colour to the dyed cloth, ſeveral hypotheſes have been formed. One is, That the fibres of wool, ſilk, &c. are hollow tubes; that the colouring matter enters them; and, after being there coagulated, ſhows itſelf through the fine tranſparent ſides of the tubes.—Another conſiders theſe filaments as ſolid lengthwiſe, but having all round their ſides an infinite number of ſmall pores like the extremities of the fine abſorbing and exhaling veſſels of the human body. In theſe pores, according to the hypotheſis, the colour is lodged; and as the pores are placed exceedingly cloſe to one another, the fine threads appear to our eyes of one uniform colour.—A third is, That the fibres are ſolid, or at leaſt with reſpect to us may be conſidered as ſuch. The ſaline ſubſtance, whatever it is, that is employed to make the colour ſtrike, ſinks into the ſurface, partly corrodes and unites itſelf with it into a third kind of ſubſtance no longer ſoluble in plain water, nor even eaſily by ſoap, but which ſtill preſerves its coagulating quality. According to this hypotheſis, the dye lies entirely on the outſide of the ſtuff, and continues as long as the effect of the ſalt continues upon the fibres of the matter to be dyed.

5
M. Hellot's theory diſproved.

Concerning the truth of theſe hypotheſes, or indeed any others that can be invented, it is impoſſible to bring any deciſive proof. It ſeems, however, more probable, that the proceſs of dyeing is accompliſhed by a coagulation of the colouring matter itſelf, rather than by any agglutination of it to the fibres by means of a vitriolated tartar, as Mr Hellot ſuppoſes. According to this gentleman's theory, a vitriolated tartar is generated in every proceſs for dyeing, and proceeds from the acid of the alum and alkaline baſis of the tartar uſed in the preparations, or in ſome of the dyeing ingredients themſelves. He ſuppoſes that the pores of the ſtuff are cleanſed and enlarged by the preparatory ſalts, and by the boiling water, in ſuch a manner as to receive the colouring particles, which particles are afterwards detained by the contraction of the pores occaſioned by cold; and further, that theſe pores are lined with a ſaline cruſt of tartar or vitriolated tartar.

On this theory the tranſlator of the Chemical Dictionary has the following obſervations. "Mr Hellot has not ſhown that pure fixed alkali is incapable of producing the effects which he attributes to his tartar and vitriolated tartar; and both theſe ſalts, though they are difficult of ſolution, and require a great quantity of water for this purpoſe, will yet diſſolve at laſt; and therefore, if the colouring particles were fixed chiefly by means of theſe ſalts, they might be waſhed out by a large quantity of water; which we find to be contrary to experience.

6
Anoth
theory

"We ſhall find it more difficult to ſubſtitute a true theory than to refute that of Mr Hellot. Many experiments ought to be previouſly made. Nevertheleſs, it may be obſerved, That the colorific particles of moſt ſubſtances uſed in dyeing ſeem to be inſoluble in water, in ſpirit of wine, and even in alkaline lixiviums: that their diffuſion through theſe liquids is cauſed merely by their adheſion to certain gummous and reſinous particles: and that they may be diſengaged from thoſe gummy and reſinous matters, by applying a piece of ſtuff to which they have a greater adheſive power, which ſeems to be the caſe of the root-coloured and blue dyes; or by applying another ſubſtance to which theſe particles have a greater power of adheſion; ſuch as the earth of alum, in thoſe dyes where that ſalt is uſed, together with ſome other ſubſtance, as fixed or volatile alkali, capable of decompoſing alum; or as the ferruginous earth of the green vitriol in black dyes, to which the colorific particles of the galls adhere; which earths are capable of applying themſelves and of adhering to the ſtuffs. The ſeparation of the colouring particles from the gummy and reſinous matters is probably facilitated by the addition of acids and neutral ſalts, which may coagulate in ſome meaſure the vegetable matters, and leave the colorific particles diſengaged; ſo that they may apply themſelves to the ſtuff, or to the earths above mentioned."

M. d
ligny
ory.

In a treatiſe on this ſubject by M. de Apligny, the nature of the different ſubſtances uſually ſubjected to this operation is particularly conſidered. Theſe are wool, ſilk, cotton, and linen. Wool was probably the firſt ſubſtance to which any kind of dye was applied, and which might probably have been done even in the fleece, while mankind, in their rude ſtate, wore the ſkins of animals. When ſome further progreſs in arts was made, and the method of manufacturing wool into worſted and cloth diſcovered, the dye would then be applied to it; but it was not till a conſiderable time afterwards that ſilk and cotton were known; and the art of dyeing linen is mentioned as a new invention even in the time of Pliny.

Wool, according to our author, conſiſts of tubes, which, like hair, contain a medullary ſubſtance, but throughout their length are ſieves with an infinite number of lateral pores; and in proportion to the greater or leſſer number of theſe pores, the woolly fibres are more or leſs curled. The reaſon aſſigned for this is, that "the more interruptions there are in the continuity of any body, the more flexible it will be: the fibres of the wool therefore being curled muſt have many pores, and conſequently great room for the extraneous ſubſtance which may be not only lodged in the exterior pores, but even penetrate into the whole extent of the tubes, after the medullary ſubſtance has been expelled. It is not therefore to be wondered at, if wool, being of all ſubſtances that are made into ſtuffs the moſt porous, ſhould be the moſt eaſy to dye, and imbibe the greateſt quantity of colour."

Silk, according to our author, may naturally be ſuppoſed to proceed originally from the mucilage of the mulberry leaf on which the animal feeds, and which he imagines is converted into an animal ſubſtance by a combination with volatile alkali; but which, by the evaporation of a thin oil, and part of this alkaline matter, becomes tough and hard. An example of ſomething ſimilar to this is obſerved on the leaves of the *ros ſolis*, on which there are found ſome drops, which being touched while the ſun ſhines upon it may be drawn out into fine and very white threads. The conſolidation of the ſilk is alſo promoted by a yellow ſubſtance with which the animal impregnates the thread; and this ſeems to be a concrete oil ſomething ſimilar to wax. Silk thread therefore is nothing elſe than a continued ſeries of moleculæ of this indurated gluten: but as in this deſiccation the moleculæ will remain at unequal diſtances, there will neceſſarily be inequalities, and conſequently pores in the thread; but as theſe pores are only on the ſurface of the thread without any interior concavity as in the wool, it follows, that ſilk can admit no particles into its pores, but ſuch as are extremely ſubtile and in very ſmall quantities; that even the particles admitted require a ſtronger maſtic or fixing ſubſtance than wool, ſince they are only ſuperficial, and incapable of penetrating. Hence ſilk is much more difficult to dye permanently than wool, and requires likewiſe a much greater quantity of colouring materials; two ounces and a half of cochineal being required to give the ſame ſhade to a pound of ſilk that one ounce will give to a pound of wool. For the ſame reaſon alſo the colours on ſilk are leſs permanent than on wool.

Cotton being a true vegetable ſubſtance muſt neceſſarily have its fibres hollow like wool, that the juices may circulate properly; but as theſe are a great deal finer, the cotton is therefore much more difficult to dye. The exterior and lateral pores of cotton are likewiſe filled with a kind of oil, which it is neceſſary to expel before the dye can be given.

Flax may likewiſe be ſuppoſed porous, but that its pores are much ſmaller than thoſe of any of the ſubſtances already mentioned. The detached and ſeparated fibres reſemble ſilk in ſome degree, only that, being more dry and compact, they take the dye with ſtill more difficulty than even cotton; and from the different textures of theſe ſubſtances we may reaſonably aſcribe the different ſhades which are taken by them even when the ſame dyeing ingredients are made uſe of. This holds good alſo with reſpect to ſtuffs differently manufactured, though of the ſame kind; the pores being neceſſarily contracted by certain kinds of fabrication, whence they receive a ſmaller quantity of the dye: and hence ſcarlet cloth, when cut, appears white internally, the colouring atoms being too large to penetrate it, which, however, does not happen in the ſtuffs which have been previouſly dipped in ſolution of alum.—A difference of ſhade will alſo be occaſioned by the different poſitions and delicacy of the fibres of the ſtuff; and by this alſo a difference is made in the brightneſs of the colour.

8
Of the action of lime.

With regard to the operation of thoſe ſubſtances commonly made uſe of for fixing the dye, our author remarks, that lime ſeems deſtined by the Author of nature for binding and uniting the two ſeemingly oppoſite ſubſtances of ſalts and earth. "Fire (ſays he) makes it ſoluble in water, and therefore eaſily uſed; but it again becomes indiſſoluble by the contact and influence of the air; and theſe properties render it capable of forming, when united to other bodies, an unalterable cement." We know ſeveral mixtures of this kind, of which lime is the baſis, and that in conſequence of theſe properties it confirms the ſolidity of many colours.

9
Of alum.

Alum has the property of attracting the colouring particles of the dye as well as of fixing them; and Pliny informs us that this property was known to the ancients. They made uſe of certain earths of the argillaceous kind, which they called *creta argentaria*, *ſaluniſia*, and *anularia*, to imbibe the colour from infuſions of dyeing ingredients; and they became much ſooner ſaturated with the colour than wool itſelf. There are two kinds of alum made uſe of in dyeing, viz. roch alum and Roman alum. The firſt is always uſed for blues and the colours inclining to black; but as this generally contains ſome particles of iron, the Roman alum is preferred for the more lively colours, as it contains nothing capable of tarniſhing their beauty. The colours are brightened by the whiteneſs of the earth, while its tenacity, produced by ſome kind of unctuoſity with which it is combined, makes it more ſolid; and the plaſtic quality of the earth makes it take the form of the pores in the ſubſtance to be dyed; whence a greater permanency of colour muſt neceſſarily enſue.

There are ſeveral other ſaline ſubſtances made uſe of in dyeing, particularly nitre, ſea-ſalt, ſal ammoniac, and tartar, &c. By the three firſt the red colours are always rendered more dark-coloured, while the others enliven the colour and give it an orange hue. Neutral ſalts with a metallic baſis ſerve to ſtrengthen the colour, which varies its ſhade according to the nature of the metallic ſubſtance with which it is combined. Green and blue vitriol are the moſt commonly uſed in this art.

10
Dyeing ſuppoſed to be an effect of attraction.

In explaining the theory of the art of dyeing, our author conſiders the whole as an effect of attraction; and in order to ſet forth this matter in a proper light, it is neceſſary, in the firſt place, to explain the conditions requiſite for the action of bodies upon one another in this way. Theſe conditions are, 1. That the attractive power be mutual in both. 2. That they ſhould be placed at a diſtance from each other proportioned to the force of attraction. 3. That this force be ſuperior to that by which the colouring matter is attracted by the water. Hence it is neceſſary for dyeing ſtuffs of any kind, that the dye ſhould conſiſt of ſmall particles ſuſpended in a liquid, in ſuch a manner that they may be ſeparated by a ſubſtance which has a greater affinity with theſe minute bodies than water. Some of theſe ſubſtances, however, are not attracted by the earth of alum, and theſe enter the pores of the cloth without its aſſiſtance; but in ſuch as require the aſſiſtance of alum, the particles are fixed by the power of attraction, at the ſame time that the acid of the alum

alum is ſoftened by its combination with the principles of theſe particles; this acid having ſerved merely as a vehicle for diſtributing equally into all the pores of the ſtuff that earth which it held in a ſtate of the greateſt poſſible diviſibility.

11
Salts cannot fix the colour in conſequence of their own inſolubility

Our author next proceeds to conteſt the theory, that ſalts, even ſuch as are the moſt inſoluble, can maintain their ſtability in the pores of the ſtuff, however inſoluble the ſalt may be in water. He obſerves that this inſolubility, however great, could not prevent a great quantity of it from being carried off by water, and conſequently the colour from being injured by the decompoſition of theſe ſalts; but fixed earth, ſuch as that of lime and alum, which from its nature obſtinately retains the phlogiſtic principles of all colours, muſt neceſſarily produce ſuch as cannot be deſtroyed but by the ſtrongeſt acids.

12
Colours depend on phlogiſton

Colours, in the opinion of our author, depend entirely upon phlogiſton. It is well known that, by the ſimple addition of any ſalt to an oily, vegetable, and colouring ſubſtance, we may either change or totally expel its colour; becauſe any ſalt, either ſimple or compound, deſtroying the combination then ſubſiſting, a new reflection of the rays of light muſt neceſſarily take place. In ſuch ſubſtances therefore as cannot have their colour affected by any ſalt, the phlogiſton is moſt probably in the moſt perfect combination with the other principles. Were we thoroughly acquainted with this combination, we ſhould be able to make perfect compoſitions for dyeing, ſimilar to what artificial cinnabar is for painting: but though we certainly know the effects produced upon ſome kinds of oils by ſalts, and can decompoſe ſome colouring ſubſtances and ſeparate their principles, we are ſtill unacquainted with the manner in which theſe principles are combined; and therefore every effort of this kind has hitherto been found inſufficient for the purpoſe.

13
Apligny's account of the action of acids and alkalies upon colouring ſubſtances.

"As the colour (ſays our author) depends upon the ſhape or figure of the conſtituent particles of the colouring bodies, the ſhade may be varied by changing their figure, but the permanency of the colour is at the ſame time diminiſhed; becauſe it is impoſſible to produce this change without altering the principles to which they owe their permanency; and this is the caſe with cochineal. The ſhades of its colour are eaſily varied by acids and alkalies."

M. de Apligny then proceeds to account for the action of acids and alkalies upon colouring ſubſtances. Cochineal is rendered darker by alkalies, and always becomes of a deep purple on adding them; and the volatile alkali is found to be more efficacious in this reſpect than the fixed kind. Theſe ſalts he ſuppoſes to produce this effect, becauſe they are natural ſolvents of animal ſubſtances; which, however, they are incapable of diſſolving without combination, cauſing only a compoſition without the diſſipation of any principle. This combination gives a degree of denſity to the colouring particles which they had not before; and thus inclines them to black, by occaſioning a greater degree of refraction in the pencils of rays. Acids, on the other hand, eſpecially thoſe of the mineral kind, burn the oil, and abſorb the phlogiſton, which is the principle of all colours. By the violence of their action a part of the phlogiſton and volatile alkali evaporates, the colouring matter becomes more rarefied, and reflects a greater number of the rays of light; whence it neceſſarily acquires a colour nearly yellow, and even quite ſo if a proper quantity be added; this being, according to our author, of all colours the neareſt to white or tranſparency. Hence it is not cuſtomary for dyers to make any uſe of fixed alkali when cochineal is the colouring ſubſtance, as it would make too great an alteration in the conſiſtence, and, by mixing with the animal oil, form a ſoap which would render the colour miſcible in water, and conſequently of the falſe kind of dye; the oil already mixed with fixed alkali being no longer at liberty to combine with the earth of alum. But after the ſubſtance has been already dyed, the fixed alkali may then be uſed with advantage in ſome caſes; becauſe the colouring ſubſtance being already converted into what our author calls a *maſtic*, cannot be diſſolved by the menſtruum unleſs the latter be uſed in very great quantity.

Acids, according to M. de Apligny, are more deſtructive in their action than alkalies; and the oil of vitriol, formerly uſed, always containing ſome ferruginous particles, a kind of Pruſſian blue was formed, which rendered the colour purple rather than otherwiſe; and even by ſimple boiling in an iron veſſel, the ſolution of cochineal always aſſumes a purple colour. The activity of ſpirit of nitre, which has been ſubſtituted in place of oil of vitriol, is ſo great, that it has been found neceſſary to give it a baſis on which it might in part exhauſt itſelf, and, by communicating part of its phlogiſton, render it leſs greedy of the cochineal. This baſis is tin, which formerly was diſſolved by ſpirit of nitre, but now by aqua regia, which was found to diſſolve it more completely. Our author's method of uſing this ſolution, however, is not by diluting it in water, and then by dipping the ſtuffs in it previous to their being dyed. "This preparation (ſays he) would not be ſufficient; for by diluting with a great quantity of water, a part of the calx would precipitate and be reduced into particles larger than when diſſolved in acids, eſpecially if uſed alone and ſeparate from the dye; the acid in that caſe not acting on the colour with ſufficient force to enliven it. Only part of this ſolution, therefore, is added to the cochineal liquor; and the acid then abandoning the tin, and combining with the oil of the cochineal, the calx of the metal ſeizes the colouring matter as it precipitates, and, as Mr Hellot obſerves, forms a kind of lacker which inſinuates into the pores of the ſtuff, and is there retained by a gluten given by the ſtarch which was added to the dyeing liquor. Hence it is eaſy to conceive why the ſcarlet dye is much leſs ſolid than the crimſon; the lacker being much drier than the ſimple colouring particles of the cochineal, is in this ſtate nearer to the nature of the mineral colours. The oil and the animal gluten, which in the crimſon dye form with the earth of alum a *maſtic*, are deſtroyed by the acid, and the ſtarch then added is an inſufficient ſubſtitute."

The ſame thing that has here been mentioned of cochineal applies equally to gum-lac and kermes; both of which afford a ſcarlet dye. The kermes, he thinks, has the advantage of being compoſed of finer particles, which more eaſily penetrate the pores of ſilk or cotton. Silk indeed, on account of the ſmallneſs of its pores, takes up only a part of the cochineal; but it extracts the whole of the colour from the cochineal, and the colour is alſo more fixed, probably becauſe the ſhrub on which the inſect is nouriſhed communicates its aſtringency, or contains a greater quantity of oil. Cotton may likewiſe be dyed with kermes, though cochineal cannot penetrate its pores.

But in whatever way the ſalts uſed in dyeing do act, it is certain they are capable, except in a very few inſtances, of fixing and giving a luſtre and permanency to the colour which otherwiſe could never be obtained. The exception to this general rule moſt commonly known is that of indigo. This is a fine blue fecula produced by fermentation from the leaves of the Indian plant called *anil.* It is very difficult of ſolution; however, it may be diſſolved by alkaline ſalts, concentrated oil of vitriol, orpiment, or combinations of ſulphur with quicklime. If a quantity of indigo is diſſolved in a fixed alkali (for volatile alkalies will not diſſolve it), the ſolution is always green, which is the natural colour produced in all vegetable blues by the alkali: but if any piece of ſtuff is put into this ſolution, though it remains green while immerſed in the liquid, the moment it comes in contact with the air, the diſſolving power of the alkali is totally deſtroyed; the indigo is precipitated upon the cloth, reſumes its native colour, and dyes the cloth blue.

The cauſe of this precipitation is very difficult to be inveſtigated. Perhaps it may be owing to an attraction of fixed air by the alkali from the atmoſphere, which renders the ſalt unable to diſſolve the indigo any longer. The adheſion of the colour ſeems merely owing to an attraction between it and the cloth; for the alkaline ſalt can contribute nothing to this, but would rather have the contrary effect. Perhaps, however, the great ſolvent power poſſeſſed by alkaline ſalts, by perfectly clearing away every kind of ſordes, may bring the indigo and cloth into nearer contact with each other, than when it is diſſolved in any other way; and conſequently the attraction will in theſe caſes be the ſtronger. This ſeems to have ſome probability; for when indigo is diſſolved in vitriolic acid, as in dyeing Saxon blue, the colour is much more eaſily diſcharged.

Another exception is in the juices of ſome vegetables, ſuch as the nuts of the anacardium. This produces, without addition, a moſt deep and laſting black, never to be waſhed out or diſcharged by any means whatever. Several other plants are to be found in different parts of the world, which give an indelible black ſtain upon linen without addition; and the colouring matter of theſe ſeems to adhere, by means of a very tenacious gluten, with which it is mixed, and which, when once thoroughly dried, can never be again diſſolved. In this reſpect, theſe black ſtaining colours ſeem analogous to the *purpura* of the ancients; which ſtained indelibly without addition, and was of an exceedingly viſcous and adheſive nature.

## SECT. II. *Practice of Dyeing.*

15
True and falſe dyes.

THE materials for dyeing different colours are ſo many and various, that an enumeration of them all is ſcarce to be expected. The ſame difference, however, takes place among the materials for dyeing which we have obſerved to take place among thoſe for COLOUR-*Making*. Some ingredients produce durable colours, which cannot be diſcharged either by expoſure to the air or by waſhing with ſoap: others, though they may be made to ſtand the action of ſoap pretty well, cannot by any means be enabled to reſiſt the action of the air. Theſe are diſtinguiſhed by the different names of *true* and *falſe*, *permanent* and *fading*, &c.; nor is there any method yet diſcovered of giving the falſe colours an equal degree of durability with the true ones. This hath been attempted by mixing a permanent and a fading colour together; in which caſe it was thought that the former would impart ſomewhat of its durability to the latter: but this hath always been found to miſgive; the fading colour ſoon flying off, and leaving the permanent one behind. Nay, in many caſes this does not even happen; for, by ſome means hitherto not accounted for, the volatile colour imparts its volatility to that which would otherwiſe be permanent. The ſame hath alſo been attempted by dyeing a piece of ſtuff partially with a fading colour, and then completing the dye with a permanent one. In this caſe it was hoped that the fading colour being covered over, and defended from the injuries of the air by the permanent one, would neceſſarily become equally durable, or at leaſt remain a much longer time than if the ſtuff was dyed with it alone. But this alſo hath been found ineffectual; and the fading colour hath been diſſipated as ſoon when covered with a permanent one, as when left without any ſuch cover. Solution of tin in aqua regia will give moſt of theſe fading colours an high degree of beauty, and ſome ſhare of durability, though even that is not able to make them equal to the others.—The moſt permanent dyes we have are cochineal and gum lac for fine reds and ſcarlets; indigo and woad for blue; and, when mixed in different proportions with cochineal or lac, for purple and violet colours. Weld, and ſome other vegetables, for yellow; and madder for coarſe reds, purples, and blacks.—The fading colours are much more numerous. In this claſs are included Brazil-wood, logwood, peach-wood, red-wood, fuſtic, turmeric root, annotto, archil, &c. &c.

16
Salts to be uſed in dyeing.

With regard to the ſalts made uſe of in dyeing, it hath been but too often cuſtomary to jumble together ſuch a quantity of different ones, that it was not only impoſſible to know in what particular ſalt the virtue reſided, but often the efficacy of the whole hath been totally deſtroyed, and the colour entirely ſpoiled by ſuch injudicious management. It is proper, therefore, where a mixture of two or more ſalts is intended to be made for dyeing, firſt to try the change of colour produced by each of the ſalts upon the colouring ſubſtance. If the colours are nearly alike, the mixture may be ſafely made as to that particular. But if the two colours produced by the different ſalts are very different from one another, to mix them together muſt be very injudicious. Thus, ſuppoſe you want to dye ſcarlet, ſolution of tin in aqua regia produces the neceſſary change of colour on the decoction of cochineal, and converts it into a high flame-colour, which ſhows it to be a proper ingredient; but to the ſolution of tin, it would ſurely be the greateſt abſurdity to add a quantity of ſaccharum ſaturni, the effect of which is to change the colour of cochineal to a dull purple. But though the ſalts taken ſeparately ſhould produce a colour nearly ſimilar, another thing muſt be regarded, namely, whe-

ther

ther they can be mixed with ſafety to one another? It is the nature of many ſalts to deſtroy one another whenever they come into perfect contact by being diſſolved in water. Thus, ſolution of tin and ſaccharum ſaturni deſtroy one another; and ſo do ſolution of tin and tartar or cream of tartar. To mix theſe together muſt therefore be abſurd; and yet we find this laſt mixture ordered in almoſt every receipt for dyeing ſcarlet. It is alſo to be obſerved, that a mixture of different ſalts ought never to be made, out of a notion that the colour will keep the better on that account; for moſt commonly it will keep the worſe. A ſingle ſalt will anſwer for this purpoſe better than a hundred. A mixture ſhould only be made where it is neceſſary to produce the colour deſired; and if a dyer proceeds in this ſimple manner, he may not only attain to great perfection in the art from his own experience without being taught by others, but even make conſiderable diſcoveries; as dyeing is at preſent far enough from being brought to perfection.—The ſalts chiefly to be uſed in dyeing are fixed alkalies; ſolutions of tin in the vitriolic and marine acids, and in aqua regia; ſugar of lead; cream of tartar; alum; oil of vitriol; and ſolution of iron in the acetous acid. By means of theſe, almoſt all kinds of colours may be dyed at an eaſy rate, and with very little trouble.

17 Primitive colours in dyeing. With regard to the operative part of this buſineſs, M. Hellot obſerves, that the whole depends on the uſe of ſome colours called by the workmen *primitive*, but which have no relation to the colours called primitive by Sir Iſaac Newton. The primitive colours uſed by dyers are in number five, viz. blue, red, yellow, fawn or root colour, and black. Each of theſe furniſh a great number of ſhades, both according to the nature of the ingredients themſelves, and the acid or alkaline ſubſtances with which they are mixed. Of theſe five colours only two ſhould be prepared with ingredients which produce no colour themſelves, but which, by their acidity, and the fineneſs of the earth they contain, diſpoſe the pores of the ſubſtance to receive the dye. Thoſe colours which in a more particular manner require ſuch a preparation are the red and yellow, with ſuch others as are derived from them. Black requires a particular preparation; but blue and fawn colour none, at leaſt for wool; it being ſufficient for the purpoſe to ſcour and ſoak this ſubſtance well; after which nothing more is required than to plunge it into the vat, ſtirring it well about, and letting it remain for a longer or ſhorter time as the colour is intended to be more or leſs deep.

13 Ingredients uſed in dyeing blue. The ingredients uſed in dyeing blue are by our author determined to be three in number, viz. *paſtel*, *woad*, and *indigo*.

Paſtel, called in Latin *iſatis* or *glaſtum*, is prepared by gathering it when come to maturity, ſuffering it to rot, and then making it up into balls for drying. For this purpoſe it is cultivated in Languedoc, and is made up into balls of 150 or 200 pounds weight. Theſe reſemble a collection of little dry lumps of earth intermixed with fibres of plants. For extracting the colour, the dyer muſt provide himſelf with large wooden vats of a magnitude proportioned to the quantity of ſtuff to be uſed. Mr Hellot recommends them from ten to twelve feet in diameter, and ſix or ſeven in height. They ſhould be made of ſtaves ſix inches broad and two inches thick, bound with iron hoops about two or three feet aſunder. They are to be ſunk in the ground for the more eaſy management of their contents, which is done by means of hooks faſtened to the end of a ſtaff, the length of which is proportioned to the diameter of the vat. The bottom is made of lime and cement, though it might be made of wood, were it not for the difficulty of getting a wooden bottom ſtrong enough to ſupport the weight. The vats uſed for dyeing cottons of a blue colour, as M. de Apligny informs us, are generally formed of large brandy pipes newly emptied, or of oil hogſheads containing about 500 quarts. Before the latter are made uſe of, they ought to be well cleanſed, by ſlaking lime in them, and ſcrubbing with a broom till the oily matter is thoroughly diſſolved by means of the lime.

Prep tions blue vat. The preparation of the blue vat is the moſt difficult operation in the whole art of dyeing; and for this our author gives the following directions: "Your copper cauldron ſhould be placed as near as poſſible to the vat, and then filled with pond-water. If the water be not ſufficiently putrid, you put in a handful of hay, viz. two or three pounds, with eight pounds of brown madder, or the bark of the root. If you could have the old liquor of a madder vat, it would ſave freſh madder, and have a better effect. The fire ſhould be lighted about three in the morning, and the mixture ſhould boil an hour and a quarter; though ſome continue the boiling for two hours and an half or three hours. The liquor is now to be conveyed into the vat by means of a ſpout, the veſſel being very clean, and having a hatful of wheaten bran at the bottom. The paſtel balls are to be put into the vat one after another while the liquor is running into it, that they may be more eaſily broken, ſtirred, and mixed with the rake, an inſtrument compoſed of a ſtrong ſemicircular piece of wood, with a long wooden handle. The mixture ſhould be continually ſtirred till all the hot liquor is emptied out of the copper into the vat; and when the latter is rather better than half full, it ſhould be covered with a lid a little larger than the circumference. There ſhould alſo be a cloth put over it, to confine the heat as much as poſſible; after which the whole ſhould be allowed to remain four hours. It ought then to be uncovered, in order to mix it thoroughly, and to give it air. About an handful of lime ought now to be put in for every ball of paſtel; and after ſcattering in this ſubſtance, the vat ſhould again be mixed and covered as before, except about an handbreadth to let in the air. In four hours after it ſhould again be ſtirred, but without giving it any more lime; then it is to be covered and ſuffered to ſtand for three hours longer, leaving a ſmall opening for air as before. At the end of three hours it may again be uncovered and well ſtirred; and if it be not yet ready and *come to*, according to the language of the dyers, that is, if the blue does not riſe to the ſurface, but that it ſtill foams, which may be known by ſtriking with the flat of the rake, it will be neceſſary, after ſtirring it well, to let it ſtand an hour and an half longer, watching it carefully during that time in caſe it ſhould caſt blue. You then ſupply it with more water till the vat is full, putting in as much indigo as you think proper.

"The indigo uſed for this purpoſe ſhould be in ſolution; and in order to diſſolve it you muſt have a ſeparate

parate cauldron and furnace, and the veſſel ſufficient for diſſolving 80 or 100 pounds of indigo muſt contain 30 or 35 buckets of hard water. This ſhould be made into a lixivium, by putting 25 buckets of clear water into the copper with the addition of a hatful of bran, 12 or 13 pounds of madder, and 40 of good pot-aſh; that is, half a pound of alkaline ſalt and two ounces and a half of madder to each pound of indigo. It ſhould boil quickly for three quarters of an hour; after which the fire ſhould be taken away from the furnace, and the reſiduum ſtand for half an hour, in order to let the ſediment fall to the bottom. The clear liquor is then poured into a clean caſk placed cloſe to the copper. Take out the grounds at the bottom of the copper, waſh it clean, return the lixivium into the copper, light a ſmall fire under it, and at the ſame time put into the copper 80 pounds of indigo reduced to a groſs powder. The liquor ſhould then be made very hot, but not ſuffered to boil; and to facilitate the ſolution, it muſt be kept continually ſtirring with a ſmall rake, to prevent it from gathering into lumps, or from burning to the bottom of the copper. The liquor ſhould be kept moderately hot, and of as equal a degree of heat as poſſible, by throwing into it from time to time ſome lixivium of lime, which ſhould be at hand ready prepared, in order to cool it. As ſoon as you perceive that there are no longer any lumps in the bottom of the copper, and that the indigo is well diſſolved and diluted, the fire is to be withdrawn from the furnace, leaving only a few hot cinders to keep it warm. Cover up the copper then, and put in a pattern of ſtuff, which ought to be green when taken out, and turn blue immediately on being expoſed to the air. Should this not be the caſe, ſome freſh and clear lixivium, prepared as juſt now directed, muſt be added.

" In preparing the paſtel-vats, one common dye-houſe kettle full is to be put in for every ball of paſtel; the veſſel is then to be filled within ſix fingers breadth of the edge, when it is to be well mixed and covered as before.

" An hour after the vat has been ſupplied with water, it muſt have two meaſures (about two handfuls) of lime for every ball of paſtel, or in proportion as it is thought that it will be required; but as ſome kinds of paſtel require much leſs preparation than others, it is impoſſible to give any accurate directions upon the ſubject. In general, however, the lime ſhould not be ſcattered in till the vat be well ſtirred.

" Having again covered the vat, a pattern is to be put in at the end of three hours, which ſhould alſo be kept three hours immerſed in the liquor, when it is to be taken out, in order to examine the ſtate of the vat. The pattern, as has already been obſerved, ought to be green when immediately taken out, but inſtantly to turn blue; and if it is of a good green, you ſtir the vat, adding one or two handfuls of lime, and then cover it. Three hours afterwards it is to be ſtirred again, adding more lime if neceſſary. Cover it then for an hour and an half longer; and when the matter is ſettled, immerſe a pattern, which muſt remain for an hour, and then be inſpected to know the ſtate of the paſtel. If the pattern be of a good green when taken out, and becomes a deep blue when expoſed to the air, another pattern is to be put in, in order to aſcertain the effect of the vat. Should the colour of the pattern be ſufficiently high, the vat is to be filled with hot water, or, if it can be procured, the liquor of an old madder vat, and then ſtirred again. If the vat wants lime, a ſufficient quantity muſt be added according to the ſmell, and as it may be found neceſſary during the working. This being done, and the vat brought to a proper ſtate, it is to be once more covered for an hour; after which the ſtuffs are to be immerſed in it."

20
M Hellot's method of preparing a blue vat on a ſmall ſcale.

This operation is ſuppoſed by ſome dyers to be impracticable, except upon a very large ſcale; but M. Hellot has made ſome experiments on this ſubject, which ſeem to evince the contrary. For this purpoſe he took a little barrel containing about 25 gallons, and put it into a copper full of water kept carefully heated. He then put 20 gallons of water into a ſmall copper with an ounce and a half of madder, and a very ſmall handful of dyer's weed; which laſt, however, he does not ſuppoſe to be of any uſe. Having made the whole to boil together for three hours, he poured all the liquor into the barrel about nine in the evening, previouſly putting into it two ſmall handfuls of bran. At the ſame time he added four pounds of paſtel; and having ſtirred it well for a quarter of an hour, he covered it up, and took care to have it ſtirred every three hours during the night. It is cuſtomary to put ſome ſour water into the large vats, but this was omitted in the preſent caſe; and the bran, which ſoured with the liquor, was found to be a ſufficient ſubſtitute. Next morning the mixture was found to be in a ſtate of fermentation, frothing up and making an hiſſing noiſe. On mixing it well, and adding an ounce and an half of ſlaked lime, the froth was increaſed; and as the ſmell became ſtronger, it was judged proper to add a little more paſtel. At half an hour after ten the vat ſmelt ſtronger of the lime; a pattern was put into it; and at the expiration of an hour, it was taken out green; and which, on being expoſed to the air, became blue. On being ſtirred, another pattern was put in about an hour afterward; which having alſo remained an hour immerſed in the liquor, came out afterwards of a deeper blue than the former. At half an hour after twelve two ounces of indigo, not diſſolved, but only powdered, ſifted, and diluted with hot water, were put in, with about the bigneſs of a walnut of the *cendres gravelees* or burnt lees of wine, which contain a large quantity of alkaline ſalt; and every two hours afterwards a pattern was put in an hour after ſtirring the vat, letting each alſo remain an hour in the liquor. This was continued till ten o'clock; and the laſt patterns were not only evidently darkeſt, but of the brighteſt colour.

The laſt pattern ſhowed that the lime was exhauſted; but on account of the lateneſs of the hour, our author added only another half ounce of lime, and an hour after put in another pattern; which after having remained an hour in the liquor, was taken out more blue than the reſt, though the colour had been rendered leſs lively by the lime. Two other patterns put in during the night were ſtill darker, though the colour was ſomewhat dull; an evidence that the lime was not yet exhauſted. The paſte which lay at the bottom was of a yellowiſh brown when taken out, but by expoſure to the air became of an olive green. Under the ſurface it appeared of the ſame colour if moved with the hand, but inſtantly became green, ſmelling rather ſtrong, though not very much of the lime. The liquor itſelf was of the colour of beer, but the ſcum or froth of a blue colour. Patterns were now put in every two hours till two in the afternoon; when that which was taken out appeared of ſuch a fine blue, that it was judged proper to fill the vat. For this purpoſe about eight gallons of water were put into a little copper with a quarter of an ounce of madder and an handful of bran; and when it had boiled for half an hour, the liquor was put into the little vat for three hours. On ſtirring and letting it then remain for an hour afterwards, a pattern was put in, which in an hour's time was taken out of a beautiful blue. An ell of ſerge was then immerſed by means of what our author calls a *croſs*; which is an iron hoop with a net faſtened to it, the meſhes of which are about an inch ſquare; and the whole may be ſuſpended at any height required by means of three or four cords faſtened to it. The ſerge had no other preparation than being made thoroughly wet; nevertheleſs, in about a quarter of an hour it was taken out very green, and on being wrung out turned blue; but on a ſecond immerſion for another quarter of an hour, the colour turned out much more lively and brighter than could have been expected. The experiment was repeated with a pound of worſted; but the vat had been ſo much exhauſted that it came out only a ſkye blue; however, by ſprinkling in about half an ounce of freſh lime, the colour was afterwards made ſufficiently deep.

21
His directions for working the paſtel vat.

For working this vat our author gives the following directions. 1. It is in a proper ſtate for working, *i. e.* for imparting the blue colour to the ſtuffs put into it, when the ſediment or grounds at the bottom is of a fine brown green; when it changes upon being taken out of the vat; when the froth which riſes to the top is of a fine Perſian blue; and when the pattern, which had been ſteeped for an hour, is of a fine green colour. 2. The vat is alſo in a proper ſtate for working, when the liquor is clear and reddiſh, and the drops which adhere to the rake are of a brown colour. 3. When the liquor is neither harſh nor too greaſy to the feel, and when it ſmells neither of lime nor of the lixivium. 4. It may be known when too much lime has been put in, by the colour of the pattern immerſed in the liquor; which, inſtead of being a fine graſs green, will be only a dirty greyiſh blue, or ſome other colour of that kind. The ſame thing may likewiſe be underſtood when the ſediment does not change colour; when there is ſcarce any efflorеſcence on the vat; and when the liquor ſmells only of lime or lixivium.

In order to rectify the ſtate of the vat in this caſe, ſeveral methods have been recommended by practical dyers. 1. Some uſe tartar or bran, adding a quantity of either as occaſion may require. 2. Others attempt to correct it by throwing in a bucket of urine. 3. Sometimes they uſe a large iron ſtove, which may reach from the grounds at the bottom to the top of the vat. This machine is furniſhed with a grate about a foot from the bottom, and an iron funnel, one end of which commences with the grate, and communicates with the external air. On forcing down the ſtove to the bottom of the vat, where it ought to be retained by iron bars, the heat of the ſtove will force up the lime to the top, where as much as is required may be taken out by a ſieve. 4. Some dyers correct a vat which has got too much lime with urine and tartar: but the beſt method, according to our author, is to put into it a ſufficient quantity of bran and madder; and if the exceſs of lime is not very great, it may be allowed to ſtand four, five, or ſix hours, or more, adding to it two hatfuls of bran and three or four pounds of madder, which ſhould be ſlightly ſprinkled on the top without any covering. At the end of four or five hours it ſhould then be ſtirred by a rake, and a pattern put in to try the effect of it. If the blue does not riſe until it be cold, it ought to have time to recover, by allowing it to ſtand without diſturbance, which ſometimes requires whole days to accompliſh; but, in general, the lime which ſeems to want ſtrength to carry on the fermentation, revives and prevents the vat for ſome time from yielding any colour. To bring it forward, ſome bran and madder ſhould be ſprinkled on the top, beſides an addition of two full baſkets of freſh paſtel, which aſſiſts the liquor, when heated again, in diſſolving the lime. 5. The vat ought now to be frequently tried by putting in a pattern, that from one hour to another you may be able to judge by the green colour how far the lime has operated. Thus the operation may be accurately conducted; for when the vat has ſuffered either by too much or too little lime, it is very difficult to manage it. 6. If, during the time that you are thus employed in retrieving the vat, it ſhould cool too faſt, you muſt endeavour to preſerve the heat by emptying ſome of the liquor, and replacing it with hot water; for when the liquor grows cold, neither the paſtel nor lime are conſumed but in very ſmall quantity. The action of the lime is alſo retarded by too great a degree of heat; and in this caſe it is proper rather to wait a little than to be in too great a hurry to reſtore the vats. 7. It is evident that the vat has ſuffered by not being ſufficiently ſupplied with lime, when there are no large air-bubbles on the top of a fine blue colour, but only a ſettled froth of ſmall tarniſhed bubbles; and when, by daſhing upon the ſurface of it with the rake, it makes a hiſſing noiſe produced by the breaking of a vaſt number of theſe ſmall air-bubbles as ſoon as they are formed. The liquor has alſo an offenſive ſmell like rotten eggs, and the ſediment does not change colour when taken out of the liquor. This accident will very probably take place, if you do not carefully attend to the ſmell of the vat, but imprudently put in the ſtuffs when the paſtel has ſpent the lime; for in that caſe the ſmall quantity of lime which remains will adhere to the ſtuffs, and will thus give them a bad colour. When this is perceived, you muſt immediately take them out, and add three or four handfuls of lime in proportion to what you ſuppoſe the vat has ſuffered, but without ſtirring it up from the bottom. On ſtirring the vat you ought to attend to the noiſe as well as to the ſmell; for if the hiſſing ceaſes, and the bad ſmell is alſo removed, there are great hopes that the liquor only has ſuffered, and that the paſtel is not impoveriſhed. But when the liquor ſmells of lime, and is ſoft to the feel, the vat is then to be covered, and allowed to ſettle for an hour and an half; after which period, if the efflorеſcence commences, a pattern is to be put in, and the ſubſequent proceſs is to be regulated by the colour it aſſumes.

Some are of opinion that the paſtel blue is much ſuperior to that obtained with a mixture of indigo; but it is undoubtedly much dearer, as yielding a much ſmaller quantity of colour: and from the experiments of M. du Fay, as well as of our author on this ſubject, it appears that the prejudice in favour of paſtel is by no means well founded. When a vat has been heated and well worked two or three times, the ſame colour is frequently preſerved, only taking out part of the ſediment. and ſupplying it with freſh paſtel; but for this no directions can be given, as it is evident that the whole muſt be regulated by the practice of the dyer. Some are accuſtomed to allow the ſame liquor to remain for years in their vats, only ſupplying it with ingredients from time to time; but this practice ſeems not to meet our author's approbation, who thinks it rational to ſuppoſe that the beſt colours will be made by emptying the vats entirely when they have been heated ſix or ſeven times, and ceaſe to give any more colour.

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With regard to the reheating of the paſtel vats, our author further obſerves, that if you heat a vat when it is exhauſted, viz. when deficient in lime, it will imperceptibly turn in ſuch a manner as to be in danger of being ſpoiled; becauſe the lime, already too much diminiſhed, will be entirely conſumed by the heat. The only remedy, if diſcovered in time, is to throw it back into the vat, to ſupply it with lime, and then wait till it recovers before you reheat. In this operation alſo care ſhould be taken to put the grounds into the copper with the liquor; and it muſt not be allowed to boil, otherwiſe ſome of the more volatile parts neceſſary for producing a good colour will be evaporated. Some do not put the indigo into the vat until ſome hours after the liquor has been emptied out of the copper, and the mixture begins to recover itſelf. This precaution is taken leſt the vat ſhould not recover, and then the indigo would be loſt. An inconvenience, however, ariſes from this practice, viz. that the indigo does not give out its colour freely; ſo that it is beſt to put it into the vat immediately with the liquor, and to ſtir it well afterwards. If a vat that has not been worked is to be reheated, it muſt not be ſkimmed as in the common operations of this kind. for then the indigo would be ſkimmed off; but in ordinary caſes the ſcum is compoſed of the earthy particles of the indigo and paſtel, with a ſmall quantity of lime. When too much lime is added, you muſt wait till it be conſumed. It might indeed be corrected by an addition of acid or other ingredients; but as theſe alſo conſume the colour, it is better to wait the natural operation of the lime itſelf. Weak lime proves likewiſe diſadvantageous, becauſe it remains in the liquor without incorporating with the paſte. When this is the caſe, the paſte ſmells ſtrong, and the liquor has a kind of ſweetiſh ſmell; but both ought to be alike in this reſpect. The remedy is to haſten the ſolution by ſtirring it often in order to mix the lime with the paſte, till the proper ſmell of the vat be reſtored, and the froth on the ſurface becomes blue.

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To ſlack the lime for the purpoſe of dyeing, ſeveral pieces are to be thrown into water one after another, taking out each piece when it begins to ferment, and putting in another. It is then put into an empty copper or other veſſel; and when fallen thoroughly into powder, it is to be ſifted through a fine ſieve, and kept in a very dry caſk.

24 Preparation of acid waters.

In this operation acid waters are ſometimes neceſſary; the method of preparing which is as follows: Fill a copper of any ſize with river water; put fire under it; and when it boils, throw it into a caſk in which you had before put a ſufficient quantity of bran. It ſhould be well ſtirred three or four times a-day. Three buſhels of bran into a veſſel containing about 70 gallons of water have been found to anſwer the purpoſe. This water, at the end of four or five days, becomes acid; and therefore may be applied in all caſes where it does not injure the preparation of the worſted. It muſt be obſerved, however, that woollen fleece, by too great a quantity of acid liquor, would be rendered difficult to ſpin, as being in a manner glued together by the matter proceeding from the bran. It is alſo neceſſary to take notice, that the acid muſt not be left in the cauldron, eſpecially if this is made of copper; becauſe it will corrode enough of the metal to occaſion a deficiency in the colour. This metal, when diſſolved, gives a greeniſh colour.

25 Construction of Dutch vats;

The Dutch vats are conſtructed in ſuch a manner as to require leſs frequent heating than thoſe above deſcribed. The upper part of them for three feet downward is of copper, and they are almoſt ſurrounded by a brick wall at about the diſtance of ſix or ſeven inches from the metal. A quantity of hot embers are depoſited in this interval, which maintain the heat of the vat ſo effectually, that it remains for ſeveral days in a ſtate fit for working even after it becomes very weak. This is not the caſe with the others, which frequently give a much deeper colour than was intended, unleſs you ſuffer them to grow conſiderably colder; and in that caſe the colour is leſs bright.

26 Of the woad-vat.

The woad-vat differs from that already deſcribed only in being weaker and yielding leſs colour; but it is prepared in the ſame manner The following is a deſcription of the woad vat, according to an experiment made by M. Hellot, ſimilar to that concerning the paſtel already mentioned.

"I placed (ſays he) in a cauldron a ſmall caſk containing about twelve gallons, two-thirds full of river-water, an ounce of madder, and a ſmall quantity of weld; at the ſame time I put into the caſk a good handful of bran and five pounds of woad. At five o'clock in the evening the vat was well ſtirred and covered. It was again ſtirred at ſeven, at nine, at twelve, at two, and at four. The woad was then working, as has been already obſerved with regard to the paſtel. Some air bubbles began to riſe pretty large, but in a ſmall quantity, and of a very faint colour. It was then garniſhed with two ounces of lime, and ſtirred. At five o'clock I put in a pattern which I took out at ſix, and again ſtirred. This pattern had received ſome colour. At ſeven o'clock I put in another, and at eight ſtirred again. This pattern was tolerably bright: I then added an ounce of indigo; at nine o'clock another pattern; at ten ſtirred again, and put in an ounce of lime becauſe it began to ſmell ſweetiſh; at eleven another pattern, and at twelve ſtirred again. This proceſs was continued till five o'clock. I then added three ounces of indigo. At ſix I tried another pattern, and at ſeven ſtirred again. It would have been now time to fill it, being in a proper ſtate for working, as the laſt pattern which had been taken out very green became a bright blue: but as I was very much fatigued, having ſat up the whole night, I choſe to defer it till the next day, in order to ſee its effect by day-light; and for this reaſon I added an ounce of lime, ſufficient to ſuſtain it till nine o'clock in the morning. Patterns were put in from time to time; and the laſt being very beautiful, I filled the vat with a liquor compoſed of water and a ſmall handful of bran only. It was then ſtirred, and patterns tried every hour. Being in a proper ſtate at five o'clock, it was immediately worked. It was then garniſhed with lime, and mixed, in order to preſerve it till ſuch time as it might be convenient to reheat.

"Two months afterwards I prepared another woad vat without indigo, that I might be enabled to judge of the ſolidity of the dye; and was convinced, by experiment, that it was of equal goodneſs with the paſtel. Hence the paſtel is ſuperior to the woad only becauſe the latter yields leſs colour than the other.

27
M. Hellot's remarks on the preceding operations.

"The little variations to be obſerved in the method of ſetting theſe different vats, ſufficiently demonſtrates that there are many circumſtances in the ſeveral proceſſes not abſolutely neceſſary. In my opinion, the only matter of importance, and which demands attention, is to conduct the fermentation with caution, and to avoid ſupplying with lime till, from the indications I have deſcribed, it appears neceſſary. With regard to the indigo, whether it be added at twice or all at once, whether a little ſooner or a little later, is, I think, of very little importance. The ſame may be ſaid of the weld, which I uſed twice, and twice omitted; and likewiſe of the pearl-aſh, a little of which I put into the ſmall paſtel vat, and omitted in that of the woad. In ſhort, it appears to me very demonſtrable, that the diſtribution of the lime either in the ſetting or reheating the vats requires moſt attention. It muſt alſo be obſerved, that in ſetting either a paſtel or woad vat, it cannot be too frequently examined; becauſe though ſome are too ſlow, which is attributed to the weakneſs of the paſtel or woad, others become too ſoon ready for working. I have ſeen ſeventy pounds of paſtel loſt by this neglect. It was ready for working at eight o'clock, but for want of the workman's conſtant inſpection, he did not diſcover it till two hours afterwards. The paſte was then entirely riſen to the ſurface of the liquor, which ſmelt very ſour. It was now impoſſible to recover it; he was therefore obliged to throw it out immediately, or it would very ſoon become inſupportably putrid and fetid.

"This difference in the vat may be alſo produced by the temperature of the air, as it cools much ſooner in winter than in ſummer. It is therefore neceſſary to watch very attentively, though it is ſeldom fit for working in leſs than 14 or 15 hours.

28
Of the indigo vat.

"The indigo vat (ſays our author) is about five feet high, two feet in diameter, and grows narrower towards the bottom, being ſurrounded by a wall, and a vacancy left for the embers. In a vat of this ſize you may put from two to five or ſix pounds of indigo. In order to ſet a vat containing twenty gallons, you boil in a copper about fifteen gallons of river-water for half an hour, with two pounds of pot-aſh, two ounces of madder, and a handful of bran. The indigo is prepared mean while in the following manner:

"Take two pounds of indigo, and put it into a pail of cold water, in order to ſeparate the ſolid from the volatile particles, which will immediately riſe to the ſurface. The water is then poured off, and the remaining indigo pounded in an iron mortar; you then put a little hot water into the mortar, ſhaking it from ſide to ſide, and pouring into another veſſel that which ſwims, and which is conſequently the beſt bruiſed. In this manner you continue to pound what remains in the mortar, ſtill adding freſh water, in order to make the fineſt part riſe to the ſurface, and ſo on till all the indigo is reduced to a powder ſo fine as to riſe in the water, which is all the preparation required. The liquor which had boiled in the copper, with the grounds of the madder and pot-aſh, which probably fell to the bottom, is thrown into the high narrow vat; at the ſame time adding the pounded indigo. The whole is then well ſtirred with a rake, the vat covered, and the embers put round it. If this operation was begun in the afternoon, you muſt renew the hot embers in the evening, which ſhould alſo be repeated both morning and evening the next day: the vat ſhould be lightly ſtirred twice the ſecond day. In order to maintain the heat of the vat, you renew the embers on the third day, ſtirring the vat twice. You then perceive, that a ſhining braſſy ſcum, divided and interrupted in many places, begins to riſe on the ſurface. By continuing the heat, on the fourth day the ſcum becomes more perfect and leſs broken. The froth that riſes upon ſtirring is now blue, and the vat a deep green.

"When it becomes green in this manner, it is an indication that the vat ſhould be filled. For this purpoſe you muſt prepare a freſh liquor, by putting five gallons of water into a copper, a pound of pot-aſh, and half an ounce of madder. When this has boiled a quarter of an hour, you fill the vat. You then ſtir it; and if it produces much froth, it will be in a proper ſtate for working the next day. This is ſufficiently known by the quantity of froth, and by the braſſy ſcaly cruſt that ſwims on the top of the liquor; alſo when, by blowing or ſtirring it with the hand, the liquor beneath is green, though the ſurface appears of a brown blue.

"This vat, of which I have juſt deſcribed the proceſs, and the firſt I had ſet, was much longer in coming to a colour than the others, becauſe the heat was too ſtrong the ſecond day; but for this accident, it would have been ready for working two days ſooner. It was attended with no other bad conſequence; and therefore, as ſoon as it was in a proper ſtate for working, I dipped at ſeveral times 30 or 40 pounds of ſerge. As the liquor was by this means diminiſhed and weakened, it was neceſſary in the afternoon to repleniſh with a freſh mixture, compoſed of a pound of pot-aſh, half an ounce of madder, and a handful of bran. Having boiled this a quarter of an hour, it was put into the vat; which was then ſtirred, covered, and a few embers put round it. In this manner it may be kept for many days; but when you mean to work it, it ſhould be ſtirred the preceding evening, and ſupplied with hot embers.

“ When you would reheat this kind of vat, and repleniſh it with indigo, you put into a copper two-thirds of the liquor, now no longer green, but of a brown blue and almoſt black. When it is ready to boil, the ſcum on the top ſhould be taken off with a ſieve; after which it ſhould be ſuffered to boil, with the addition of two handfuls of bran, a quarter of a pound of madder, and two pounds of pot-aſh. The embers are then taken from under the copper, and a little cold water thrown in to ſtop the boiling. It is then emptied into the vat, with the addition of a pound of indigo pulverized and diſſolved in ſome of the liquor, as I have ſaid above. The vat being then ſtirred, covered, and a few hot embers put round it, will be fit for working the next day.

“ When an indigo vat has been reheated ſeveral times, it ſhould be emptied out entirely and ſet anew, becauſe the colour becomes dull: for though heated, and in a proper ſtate for working, the green colour is not ſo beautiful as at the beginning.

“ I have had ſeveral other vats ſet in the ſame manner, with a greater or leſs quantity of indigo; as from one to ſix pounds, proportionably increaſing or diminiſhing the other ingredients; always, however, putting a pound of pot-aſh to a pound of indigo. From other experiments which I have ſince made, I am convinced that this proportion was not abſolutely neceſſary. I am alſo perſuaded that there are many other methods for the preparation of the indigo vat equally effectual. I ſhall nevertheleſs make ſome obſervations concerning this vat.

“ Of all thoſe which I have had prepared in this manner, I failed but in one; which was occaſioned by neglecting to put hot embers round it on the ſecond day. I added ſome pulverized arſenic, but without any effect; it would never come to a colour. Red-hot bricks were alſo thrown into it at ſeveral times; the liquor at times became greeniſh, but never ſufficiently. At length, after having to no purpoſe tried ſeveral other means without being able to diſcover why it did not ſucceed, and having reheated it ſeveral times, I had it thrown out at the fortnight's end.

“ The ſeveral other accidents which I met with in the conduct of the indigo vat only retarded the ſucceſs; ſo that this operation may be conſidered as very eaſy in compariſon of the paſtel or woad vat. I have indeed made ſeveral experiments on each of them, with an intent to ſhorten the time of the preparation; but for the moſt part not ſucceeding, or at leaſt not better than by common practice, it is needleſs to deſcribe them.

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“ The liquor of the indigo vat is not in every reſpect like that of the paſtel. Its ſurface is a brown blue, covered with coppery ſcales, and the liquor itſelf of a fine green. The ſtuff or woollen which it dyes is green when taken out, and becomes blue immediately afterwards. The ſame obſervation has been made with regard to the paſtel vat, but it is very ſingular that the liquor of the latter is not green, though it produces the ſame effect upon woollen as the other. It is alſo neceſſary to obſerve, that when the liquor of the indigo vat is changed out of the veſſel, and too long expoſed to the air, it loſes its green colour, and at the ſame time all its qualities; ſo that, though it yields a blue colour, it is not permanent.

30
Cold indigo vat with urine.

“ There is likewiſe a cold preparation of an indigo vat with urine, and it is alſo worked cold. For this purpoſe, you take four pounds of indigo powdered, and put it into a gallon of vinegar, leaving it to digeſt over a ſlow fire for 24 hours. At the expiration of this time, if it be not perfectly diſſolved, it is again pounded in a mortar with the liquor, adding now and then a little urine. You afterwards put into it half a pound of madder, mixing it well by ſtirring the whole with a ſtick. When this preparation is finiſhed, you pour it into a caſk containing 60 gallons of urine: it is of no conſequence whether it be ſtale or freſh. You mix and ſtir the whole well together; and this ſhould be repeated morning and evening during the ſpace of eight days, or till the ſurface of the liquor becomes green when ſtirred, and produces froth like the common vats. It may be worked immediately without any other preparation than ſtirring it three or four hours before hand. This kind of vat is extremely convenient; becauſe when it is once prepared, it remains ſo always till it is entirely exhauſted, that is to ſay, till the indigo has yielded all its colour: hence it may be worked at all times, whereas a common vat muſt be prepared over night.

“ According as you would have this vat more or leſs conſiderable, you augment or diminiſh the ingredients in proportion to your quantity of indigo: thus for every pound of indigo you always put a quart of vinegar, two ounces of madder, and fifteen gallons of urine. This vat is much ſooner prepared in ſummer than in winter. If you would haſten it, you need only take a little of the liquor, heat it in a copper without ſuffering it to boil, and afterwards pour it into the vat. This operation is ſo very ſimple, that it is almoſt impoſſible it ſhould fail.

“ When the indigo is entirely exhauſted, the vat may be renewed by diſſolving ſome freſh indigo in vinegar; but you muſt add madder in proportion to the quantity of indigo, and then pour it into the vat, which ſhould be ſtirred as at firſt morning and evening: it will be as good as if it were freſh. This, however, ſhould not be repeated more than four or five times; becauſe the grounds of the madder and indigo would tarniſh the liquor, which would conſequently render the colour leſs bright. I muſt however confeſs, that as I have not myſelf experienced this vat, I cannot anſwer for its ſucceſs: but the following with urine, which I have ſeen prepared, dyes woollens a very permanent blue.

31
An hot vat with urine.

“ A pound of indigo was firſt ſteeped in a gallon of urine for 24 hours; it was afterwards ground in a large iron mortar with the ſame urine. When by this means the urine became very blue, it was ſtrained through a fine ſieve into a ſmall tub; but the indigo which remained in the ſieve was beaten again in the mortar with another gallon of freſh urine, and this was repeated till all the indigo paſſed through the ſieve with the urine. This operation, which continued two hours, being finiſhed, about four o'clock in the evening 62 gallons of urine were put into a copper, which was made very hot, but without boiling; and the ſcum which roſe on the ſurface of the urine was bruſhed off the copper

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with a beſom. This was frequently repeated till nothing roſe but a ſlight white ſcum. The urine being thus ſufficiently purified and ready to boil, it was thrown into the wooden vat; the prepared indigo was then added, and the vat ſtirred with a rake, in order that the indigo ſhould incorporate with the urine. Immediately afterwards a mixture, conſiſting of a gallon of urine, a pound of alum, and a pound of red tartar, was added to the vat; but theſe were firſt reduced to a fine powder. The urine was then poured out on it in the mortar, and mixed together till it ceaſed to ferment. It was then poured into the vat, well ſtirred, and covered. In this ſituation it was left all night. The next morning the liquor was very green. This ſhowed that the vat was in a proper ſtate, and that it might have been uſed; but it was ſuffered to remain without working, becauſe all that had been hitherto done was only the firſt preparation of the vat, and the indigo which had been put into it was deſigned only to nouriſh and temper the urine. Hence the vat was ſuffered to reſt two days in order to complete the preparation, but covered all the time to prevent it from cooling too faſt. It was then managed as follows: A ſecond pound of indigo was beaten with purified urine as above. About four o'clock in the afternoon the whole vat was emptied into the copper: it was then made very hot, but not boiled. It ſtill produced a thick ſcum, which was taken off; and the liquor, being near boiling, was returned into the vat. The indigo was immediately added, bruiſed as above, with a pound of alum, a pound of tartar, and two quarts of urine, with the addition of another pound of madder: it was then ſtirred, cloſe covered, and ſuffered to remain ſo all night. The next morning it was in very good order; the liquor being very hot, and of a beautiful green: hence it was evidently in a proper ſtate for dyeing; which was executed in the following manner. The ſubſtance to be dyed was woollen fleece.

" This fleece had been well ſcoured with urine, well waſhed, and perfectly well drained. Being thus prepared, 30 pounds of it were put into the vat. It was then well opened with the hands, that it might be equally drenched; and after this it was ſuffered to remain an hour or two according to the degree of ſhade that was required. During this time the vat was kept cloſe covered, in order to preſerve the heat; for the hotter it is, the better it dyes: when it becomes cold, it ceaſes to act. When the wool was ſufficiently blue, it was taken out in large balls, as big as a man's head; and at the ſame time ſqueezed and wrung over the vat, and immediately given to four or five women who ſtood round the vat, in order to open it, and expoſe it to the air between their hands till the green colour which it had coming out of the vat changed to blue. This change was produced in three or four minutes. Theſe 30 pounds being thus dyed, the vat was raked, and then ſuffered to ſtand for two hours, keeping it always cloſe covered. At the expiration of this time they put in another 30 pounds of wool, which was opened well with the hands. The vat was again covered; and in four or five hours this wool had taken as good a colour as the former: it was then taken out of the vat in balls in the ſame manner as the former. This operation being finiſhed, the vat was ſtill warm, but not ſufficiently ſo to dye any more wool; for when it has not a ſufficient degree of heat, the colour which it yields will be neither uniform nor ſolid: hence it is neceſſary to reheat and repleniſh with indigo as before. This may be done as often as you think proper; becauſe this vat never ſpoils by age, provided that while it is kept idle you give it a little air.

" About four o'clock in the afternoon all the liquor was emptied into the copper, with the addition of a ſufficient quantity of urine to replace what had been evaporated and loſt in the preceding work. This generally requires about eight or nine buckets of urine. The copper was then heated, the ſcum taken off as before: when ready to boil, it was returned into the wooden vat. You add to it a pound of indigo, pounded and mixed with urine as above, a pound of alum, a pound of tartar, a pound of madder, and two quarts of urine. After the vat is ſtirred and cloſe covered, it is ſuffered to ſtand all night. It will be in a proper ſtate the next day, and capable of dyeing 60 pounds of wool at twice, as above. In this manner, the reheatings ſhould be always done the day before you want to dye, and may be repeated *ad infinitum*.

" It is neceſſary to obſerve, that the more indigo you put into the vat at once, the deeper the colour: thus, inſtead of one pound, you may add four, five, or ſix, without increaſing the quantity of alum, tartar, or madder; but if the vat contains more than three hogſheads, the quantity of the ingredients ſhould be proportionably augmented. That which I have juſt mentioned contained only three hogſheads, and was conſequently too ſmall to dye at one time a ſufficient quantity of wool to make a piece of cloth, *viz.* 55 or 60 pounds. To do this properly, it ſhould contain ſix hogſheads, which would be attended with a double advantage. Firſt, all the wool might be dyed in two or three hours; whereas, by twice dipping, it could not be finiſhed in leſs than eight or ten. Secondly, at the expiration of the three hours, the vat would be ſtill very warm; ſo that, after ſtirring and letting it ſettle for a couple of hours, the ſame wool may be dipped again. By this means the colour is heightened almoſt as much more; becauſe wool once dyed always takes a much better colour than new or white wool, though ſuffered to remain in the vat even for 20 hours.

" It is neceſſary to be very attentive in opening the dyed balls as ſoon as they are taken out of the vat, and expoſing them to the air, in order to change them from green to blue, which ſhould be done by many hands at the ſame time, that they may be equally affected by the air, elſe the blue colour will not be uniform.

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Paſtel prefer. to the bove.

" Some manufacturers pretend that cloth, the wool of which had been dyed in this urine vat, cannot be perfectly ſcoured by fulling even at twice; others affirm the contrary, and I believe they are right. Nevertheleſs, if the firſt be right, one would ſuppoſe that the animal oil of the urine was become reſinous by drying on the wool, or that incorporating with the oil by which the wool had been moiſtened for its other preparations, it would be more likely to reſiſt the fuller's earth and ſoap than ſimple oil by expreſſion. To remedy this, it is only neceſſary to waſh the wool in running water after it has been dyed, expreſſed, and opened, ungreened, and again cold. Be this as it may, a paſtel vat in a large dye-houſe is preferable to thoſe kinds of indigo vats prepared with urine; becauſe with a good woad vat and a dexterous woad-man, you expedite more work than could be accompliſhed with any other blue vat. In mentioning the ſeveral indigo vats in this treatiſe, my deſign is not ſo much to introduce them to great manufactories, as to aſſiſt thoſe who work at ſmall fabrics; to whom, I flatter myſelf, this treatiſe will be equally uſeful. I will even deſcribe a cold vat for the dyers of ſmall ſtuffs mixed with thread or cotton, which ſucceeds very well, but which would be of no uſe for woollens.

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" In ſome places they make uſe of a cold indigo vat, differing from that already mentioned, which is more commodious, as it is much ſooner ready, and has no bad ſmell. It is prepared in the following manner.

" Three pounds of indigo, well pulverized, is put into a glazed earthen veſſel, and diſſolved in three pints of ſoap-boiler's lixivium, which is a ſtrong ſolution of foſſile alkali with quicklime. I have made uſe of a ſolution of potaſhes, and ſucceeded very well. The ſolution of indigo is performed in about 24 hours, as may be eaſily diſcovered by its remaining ſuſpended in the liquor, which is thereby thickened, and becomes like an extract. At the ſame time you put into another veſſel three pounds of ſlacked lime ſifted with ſix quarts of water. The whole ſhould boil during a quarter of an hour, and when ſettled ſhould be drained off clear. You afterwards diſſolve in this lime-water three pounds of green copperas, ſuffering it to ſettle till the next day. You then put 75 gallons of water into a large deal caſk, the only wood proper for the purpoſe; as any other, particularly oak, would blacken and tarniſh the liquor. The two ſolutions, which had been prepared the night before, are then added, the vat ſtirred, and left to ſettle. I have ſeen it ſometimes take the colour in two hours; but with this vat it was very different, not being ready till very late the next day. It produces a great quantity of froth; and the liquor takes a fine green colour, but a little yellowiſh, ſomething like the green of the common vat.

" When the vat is almoſt exhauſted, it is repleniſhed and quickened without freſh indigo, by adding to it a ſmall liquor, conſiſting of two pounds of green copperas diſſolved in a ſufficient quantity of lime-water. But when the colour of the indigo is quite exhauſted, it ſhould be repleniſhed with freſh indigo diſſolved in a lixivium, ſuch as I have juſt deſcribed. It is natural to ſuppoſe, that the quantity of your other ingredients muſt be augmented or diminiſhed in proportion to the indigo. Some dyers uſe a mixture of vinegar and water impregnated with ruſty iron. They ſuppoſe that the colour is thereby rendered more ſolid; but I am convinced by experience that there is no neceſſity for it, and that the colour is as permanent as any of the other blues prepared as I have directed above.

" The firſt time I prepared this vat, I proceeded according to a receipt ſent me from Rouen. The ſoap-boiler's lixivium was ſimply denominated *ſtrong water*. I ſuſpected this to proceed either from malice or miſtake, nevertheleſs, as in matters of fact it is unjuſt to condemn without examination, I tried the common aqua-fortis, which produced the following effect.

34
Effects of aquafortis upon indigo.

" I took half a pound of indigo, well powdered, and ſteeped it in half a pint of common aqua-fortis, made with vitriol and ſalt-petre: this produced a fermentation. In this ſituation I left it for 24 hours; and having, as in the preceding operation, diſſolved a pound of copperas in ſome lime-water, I poured theſe two mixtures into a caſk containing about 17 gallons of river water. I ſtirred it well, but there appeared nothing extraordinary the next day. I ſtill continued to ſtir three times a-day for two days together, and then ſuffered it to reſt for two days more, perſuading myſelf that it was abſolutely ſpoilt. At the expiration of theſe four days, the liquor became of a red colour, but clearer than the paſtel vats. I ſtirred it once more, and let it ſtand ſix days longer: it had then a little froth, but very pale: ſix days afterwards the ſurface of the liquor became brown, and underneath a brown green. I ſtirred again, and fancied that the liquor underneath was ſtill reddiſh, though the froth which it threw up was of a good colour; I therefore conceived hopes that it would do, and that I ſhould be able to work it the next day.

" At the expiration of ſixteen hours I dipped ſome cotton, which took colour, but ſo very weak, that I was obliged to let it remain in the liquor ſeveral hours, till the blue became ſufficiently deep. It then withſtood the ſummer air and ſun tolerably well for 12 days; nevertheleſs, I had the vat thrown out as uſeleſs, on account of its tedious operation. Doubtleſs it might have been recovered with lime, or ſome other alkali that would have abſorbed the acid of the aqua-fortis, but it was not worth the pains. Beſides, the anſwer which I received from the perſon who ſent me the receipt from Rouen, contained an explanation with regard to the kind of aqua-fortis that ſhould be uſed; from which I learnt that it ſhould have been the ſoap-boiler's lixivium, which, inſtead of being acid, is one of the moſt cauſtic alkalies. In fact, by making uſe of this alkaline lixivium, the operation was attended with immediate ſucceſs, and never failed me ſince.

35
Of dyeing blue in ſmall quantities.

" I tried ſeveral of theſe different vats in miniature, in cucurbits, put into a water or ſand bath. Theſe laſt are attended with no difficulty; it is only neceſſary to diminiſh the quantity of the liquor, and of every ingredient, in proportion to your vat, and it is ſcarce poſſible it ſhould not ſucceed.

" Concerning that which I firſt deſcribed, and which is ſet hot, as it is attended with a little more difficulty, and ſeveral perſons may wiſh to try this operation themſelves, being rather curious, and requiring neither expence nor preparation in miniature; I will give the deſcription of a proceſs which ſucceeded extremely well, and which I purpoſely ſupplied with much more indigo than is generally done in the common method.

" I boiled two quarts of water with two drachms of madder, and four ounces of pearl-aſhes. When it had boiled a quarter of an hour, I poured it into a cucurbite, containing about a gallon, which was previouſly heated with hot water, in which I had put a quarter of a handful of bran. The whole being well ſtirred with a deal ſpatula, I put my cucurbite into a very moderate ſand heat, ſufficient only to keep it warm, or nearly of the ſame degree of heat requiſite in a common indigo vat.

"I continued the ſand heat all night and the next day, without perceiving any alteration. I ſtirred it only twice during the day with the ſpatula. The day following it produced an effloreſcence, formed a coppery ſcum on the ſurface, and the liquor became a brown green. I then filled it with a mixture, compoſed of a quart of water, two ounces of pearl-aſhes, and a little bran. It was well mixed, and then left to ſettle. It became perfectly well coloured, and the next day I dyed ſeveral bits of woollen ſtuffs. Theſe vats are reheated and repleniſhed with as much eaſe as a great one."

36 Method of dyeing wool or woollen ſtuffs in any of theſe vats.

"After having prepared the vats according to any of the methods above mentioned, the dyeing any kind of woollen ſtuff is exceedingly eaſy; no other preparation for the dye being requiſite than ſimple immerſion in warm water, wringing them, and then dipping them in the vat for a longer or ſhorter time according to the deepneſs of the colour you wiſh to impart. From time to time the ſtuff ſhould be opened; that is, taken out and wrung over the vat, and expoſing it for a minute or two to the air till it becomes blue; for it muſt be obſerved, that in all the ſolutions of indigo or other materials hitherto deſcribed, the blue colour is produced by expoſure to the air alone, and the ſtuff is always taken out green, and will retain that colour if not expoſed to the air. In dyeing blue, therefore, it is neceſſary to let the colour change in this manner before you immerſe it a ſecond time, that the ſhade may be the better diſtinguiſhed; for dark blues require to be dipped ſeveral times, but it is dangerous to make this experiment with light blues. When a large quantity of wool is to be dyed, which cannot be put into the vat all at once, it very often happens that the quantity firſt put in will take up the deepeſt dye. To prevent this, ſome dilute their indigo-vat with a quantity of warm water; but M. Hellot diſapproves of this, as being apt to produce a fading colour. The beſt method, he ſays, is to dip them when the vat is nearly exhauſted; and for this purpoſe he recommends the paſtel-vat rather than any other: and though the colours produced in this manner are leſs bright than the others, they may be ſenſibly enlivened by paſſing the ſtuffs through boiling water. This, he ſays, is proper for all blue colours; as it not only renders the dye more fixed and bright, but cleanſes the ſtuffs from accidental impurities. After the work is taken out of the hot water, it is to be rinſed in a running ſtream. It will be ſtill more proper to full a dark blue ſtuff well with ſoap and water, and afterwards to rinſe it in running water; for the ſoap will be ſo far from injuring the colour, that it will thereby be rendered more bright and lively. Some dyers, in order to ſave the dearer ingredients of paſtel or indigo, make uſe of logwood; but this is by no means allowable, as the colour, though rather brighter than that of indigo, is exceedingly periſhable. In 1748, M. Macquer of the Royal Academy of Sciences diſcovered a method of dyeing ſilk and cloth with a preparation of Pruſſian blue, ſuperior to all the blues hitherto diſcovered. This, however, has never yet come into practice, nor is it at all probable that the colour of this pigment can ever be made to ſtand waſhing with ſoap. In all the methods in which we could try the experiment, it could not even bear waſhing with plain water. Indeed, when we conſider the great volatility of the colouring matter of Pruſſian blue, that it can only be fixed by iron, and that any alkaline matter will inſtantly diſengage it, and make it reſume its former volatility, there can be but very little hope of overcoming the difficulties which attend the proceſs.

37 M. M quer's thod o dyein of a bl colour

Having been ſo particular with regard to the preparation of the materials and method of dyeing wool, we need ſay the leſs concerning the method of dyeing ſilk or cotton. The following compoſition is recommended by M. Macquer. "To eight pounds of the fineſt indigo add ſix of the beſt pearl-aſh, from three to four ounces of madder for every pound of aſhes, beſides eight pounds of bran, waſhed in ſeveral waters to take out the flour. When waſhed, and moſt of the water ſqueezed out, it is placed alone at the bottom of the vat. The pearl aſh and the madder are then mixed, bruiſing them thoroughly together, and then boiling them for a quarter of an hour in a copper containing two thirds of the vat; the liquor is then ſuffered to reſt, and the door of the furnace ſhut.

"Two or three days previous to this, eight pounds of indigo are ſteeped in a bucket of warm water, waſhing it well, and even changing the water, which has a reddiſh caſt. Some begin with boiling the indigo in a ley of one pound of pearl-aſh with two buckets of water; after which they pound it while quite wet in a mortar; then while it is yet in a paſte, they fill the mortar with hot liquor which has been boiled before; letting it ſtand to ſettle for a ſhort time, and then pouring off the clear into a ſeparate boiler or into the vat. The ſame quantity of the mixture is then poured on the indigo which remained in the mortar, bruiſing and mixing it well, and then as before pouring it off into the boiler; which operation is repeated till the whole of the indigo is thus diſſolved in the liquor. That in the boiler is gradually poured into the vat upon the bran in the bottom, adding afterwards the remainder of the compoſition, grounds and all. After ſtirring and raking for ſome time, it is let ſtand, but without fire, till it becomes cool enough for the hand to bear. After this a little fire is to be put round the vat, only to preſerve the ſame degree of heat; and this ſhould be continued till the liquor becomes green, which is eaſily known by trying it with a little white ſilk. This ſhows that the vat is in a proper ſtate; but in order to be aſcertained of this, it will be neceſſary from time to time to ſtir it with a rake, when the brown and coppery ſcum which appears upon it after ſtanding for a little time ſhows that it is in a proper ſtate for working. Even in this caſe it is neceſſary to behave with the utmoſt caution, and to obſerve whether on blowing aſide the coppery ſcum juſt mentioned a freſh one appears or not; for if it does not, it is a ſign that the vat is not yet ready. If the ſcum appears, it muſt ſtand three or four hours, when a new compoſition is made to complete it. For this purpoſe as much water as is neceſſary to fill the vat is put into a copper, boiling it with two pounds of aſhes and four ounces of madder as at firſt. This new liquor is poured into the vat, raked and mixed, and then left to ſtand for four hours, when it is ready for dyeing.

The method of preparing ſilk for the blue dye is by boiling with ſoap, uſing 35 or 40 pounds of the latter to 100 of the former; but no impregnation with alum is required. Before dipping it in the vat, however, it ſhould be waſhed from the ſoap; and to cleanſe it more effectually, it ought to be twice beetled at the river, having been divided into hanks for the conveniency of wringing. After being dipped in the vat, it is to be wrung as hard as poſſible, and then opened out to the air, to give it the blue colour, as directed for wool; it ſhould then be immediately waſhed in two waters, and well wrung out again. Laſtly, it is to be dried as quickly as poſſible; cutting the thread which ties it, if the hanks are large, becauſe if kept tied it frequently turns red under the thread.

Silk dyed as above directed is apt to take the blue very unequally, and will moſt certainly do ſo, if not waſhed and dried immediately after dyeing. Fine dry weather is always beſt for theſe operations; for ſhould water accidentally fall upon it, it would be full of reddiſh ſpots. In moiſt weather, therefore, and during the winter, a room with a ſtove will be neceſſary. Different ſhades of blue are produced by dipping that firſt which is intended for the darkeſt colour.

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The method of dyeing cotton or linen blue is ſo little different from that already deſcribed with regard to woollen or ſilk, that nothing farther needs be ſaid concerning it: only the colour upon cotton is generally leſs bright. M. de Apligny indeed tells us, that he has diſcovered a method of dyeing cotton velvets of a moſt beautiful and durable blue: but as he does not chooſe to communicate it, nothing can be ſaid on the ſubject. In the former edition of this work, a receipt was given for dyeing cotton of a very good blue colour, and which, as being inſtantaneouſly done, may occaſionally be uſeful. The indigo is diſſolved in a mixture of lime and potaſh (probably the pure cauſtic lixivium would anſwer fully as well); and after it is diſſolved, ſome raiſins beat into a pulp in a braſs or marble mortar are to be added. This very ſoon produces a copper-coloured ſcum at top; and the cotton being now dipped into the liquor receives the colour in an inſtant. Linen may be dyed in the ſame manner.

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lours.

The next of the primitive colours to be conſidered is red; of which there are many varieties: but the principal are ſcarlet, crimſon, and madder red. The dyeing of theſe colours differs conſiderably from that of the blues, becauſe they require a previous preparation in the ſtuffs to be dyed; and it is on this preparation that the goodneſs of the colour very often depends. Theſe preparations are generally alum, tartar, aquafortis, aqua-regis, or ſolution of tin in theſe acids. Galls and alkaline ſalts are alſo ſometimes added, tho' they do not of themſelves contribute any thing to the colour.

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There are three kinds of ſcarlet, viz. that dyed with kermes, with cochineal, and with gum-lac. The firſt, called *Venetian ſcarlet*, is the leaſt bright, but more permanent, and leſs apt to be ſpotted than the others; inſomuch that in ſome pieces of tapeſtry done with this at Bruxelles in Flanders, it has ſcarce loſt any of its vivacity in 200 years. However, it is ſcarce ever uſed except for tapeſtry, and is dyed in the following manner, according to Mr Hellot.

“ The wool ſhould be firſt drenched; for which purpoſe you put half a buſhel of bran into a copper, with a quantity of water ſufficient for 20 pounds of wool, which to the beſt of my knowledge is the uſual batch for one dyeing. In this liquor it ſhould boil for half an hour, ſtirring it from time to time; after which it is taken out and drained. I ſhall obſerve, once for all, that when you dye worſted, you put a rod through each ſkein, which commonly weighs about a pound, and which ſhould be kept on the rod during the whole proceſs, by which means the ſkein is prevented from tangling. It is alſo convenient for turning the ſkein, in order to dip each part, that the whole may be equally coloured; for which purpoſe, you raiſe it about half way out of the liquor; and holding the rod with one hand, you pull the ſkein with the other, ſo as to let the part which before was next the rod fall into the liquor. If the worſted ſhould be too hot for the fingers, it may be done by means of another rod. The equality of the colour depends ſo entirely upon the frequency of this manœuvre, that it cannot be too ſtrenuouſly urged. In order to drain them, you reſt the ends of the rods juſt mentioned on two poles; which ſhould be fixed in the wall over the copper.

“ While the worſted is draining, after being thus drenched, you prepare a freſh liquor, viz. by throwing out what remained in the copper, and repleniſhing with freſh water; to this you add about a fifth part four water, four pounds of Roman alum groſsly pounded, and two pounds of red tartar. As ſoon as it boils, the worſted on the rods ſhould be immerſed for two hours, almoſt continually moving the rods, one after another, as I have before directed.

“ It is neceſſary to obſerve, that after the alum is put in, when the liquor is ready to boil, it will ſometimes riſe ſuddenly out of the copper, if you do not mind to check the boiling by throwing in cold water. If, when it is ready to boil, you put in the cold worſted quickly, it will have the ſame effect. It is alſo proper to obſerve, that when dyers work in the great, they ſhould have their legs bare, that the hot liquor may not reſt in the ſtockings. When the quantity of tartar is rather conſiderable, as in the preſent operation, the liquor does not riſe ſo high; but when there is nothing beſides the alum, ſometimes, when it begins to boil, half of the liquor boils over, unleſs prevented by the above precautions.

“ When the worſted has boiled in this liquor for two hours, drained, lightly ſqueezed, and put into a linen bag, it is depoſited in a cool place for five or ſix days, and ſometimes longer; this is called *leaving the worſted in the preparation*. This delay helps it to penetrate, and increaſes the action of the ſalts; for as a part of the liquor conſtantly evaporates, it is clear that what remains, being more impregnated with the ſaline particles, becomes more active, that is to ſay, provided there remains a ſufficient degree of moiſture; for the ſalts being once cryſtallized and dry, their power is deſtroyed.

“ When the worſteds have remained in this ſtate for five or ſix days, they are then in a proper condition for being dyed. A freſh liquor is then prepared, according to the quantity of the worſted; and when it grows warm, if you want a full ſcarlet, you throw into it 12 ounces of pounded kermes to every pound of worſted; but if the kermes be ſtale, it will require pound for pound.

pound. When the liquor begins to boil, the worſted ſhould be put in, being ſtill moiſt; but if it has been ſuffered to grow dry after boiling, it ſhould be put into warm water, and well drained.

“Before you put the wool into the copper with the kermes, it were adviſable to throw in a ſmall handful of refuſe wool, which, being boiled for a moment, imbibes a part of the blackneſs and droſs of the kermes; ſo that the wool afterwards dyed takes a much more beautiful colour. You now dip the ſkeins on the rods in the ſame manner as in the preparation, continually ſtirring them, and giving them air, from time to time, one after another. In this manner they ſhould be kept boiling for a full hour. They are then waſhed and drained.

“If you would reap any advantage from the dye ſtill remaining in the liquor, you may dip a little prepared wool, which will take a colour in proportion to the goodneſs of the kermes, and to the quantity which had been put into the copper.

“If you mean to dye a number of ſhades, one darker than another, you require much leſs of the kermes; 7 or 8 pounds being ſufficient for 20 pounds of prepared wool. You then dip the quantity of worſted intended for the lighteſt ſhade, leaving it in the copper no longer than neceſſary, in order to turn it, that it may imbibe the colour equally. It is then raiſed upon the pegs, and the next ſhade immediately put in, and ſuffered to remain for a longer time. You proceed in this manner to the laſt ſhade, which ſhould alſo remain till it has acquired the colour you deſire.

“You begin with the lighteſt colour, becauſe if the wool was ſuffered to remain in the copper longer than neceſſary, it would be no loſs, provided you reſerve this batch for the darker ſhade: whereas, by beginning with the darkeſt, you would have no remedy in caſe of any accidental ſkip in the light ſhades. The ſame precaution is neceſſary in regular ſhades of all colours; but of the colour in queſtion theſe are ſeldom made, becauſe the dark ſhades are not much in uſe: and as the operation for all colours is the ſame, what I have ſaid reſpecting this will anſwer for all the reſt.

“When the wool has been dyed in this manner, and before it is carried to the river, you may ſwill it in warm water, with a ſmall quantity of ſoap, well diſſolved; this adds a brightneſs to the colour; but, at the ſame time, gives it a little of the roſe, that is to ſay, a crimſon tinct.

“In order to render this colour more bright and beautiful than common, I have tried a great number of experiments, but could not obtain a red equal to that produced by cochineal. Of all the liquors for the preparation of wool, that which ſucceeded the beſt was made according to the proportions I have mentioned. By changing the natural tinge of the kermes, by various kinds of ingredients, metallic ſolutions, &c. various colours may be obtained, which I ſhall preſently mention.

“It is impoſſible to preſcribe any proportions for an ell of ſtuff, conſidering the infinite variety of their breadth, and even of their thickneſs, and the quantity of wool in their fabrication; experience is the beſt guide. Nevertheleſs, if you chuſe to be exact, the ſureſt way is to weigh the ſtuff to be dyed, and to diminiſh about one quarter of the colouring ingredients preſcribed for worſteds; becauſe the ſtuffs take internally leſs colour, as their texture, being cloſer, prevents it from penetrating; whereas the worſted or woollen fleece takes the colour internally as eaſily as on the exterior ſurface.

“The alum and tartar, uſed in the preparation for ſtuffs, ſhould alſo be diminiſhed in the ſame proportion; neither is it neceſſary to let the ſtuffs remain in the preparation as long as the worſted: they may be dyed even the day after they had been boiled.

“Woollen fleece dyed in the red of kermes, and to be afterwards incorporated in mixed cloth, or for the manufactory of thick cloths, will have a much finer effect than if dyed with madder.

Hal
ſcarl

“A mixture of half kermes and half madder, is called *ſcarlet in half-grain*. This mixture gives a colour extremely permanent; but not ſo lively, inclining rather to a blood colour. It is prepared and worked preciſely in the ſame manner as if kermes alone were uſed; only that in the liquor they put but half this grain, the other half is ſupplied by madder. This is conſequently much cheaper; and it frequently happens that the dyers who make it, render it much leſs beautiful than it might be, by diminiſhing the quantity of the kermes and increaſing that of the madder.

“From the trials made on ſcarlet in grain, or ſcarlet of kermes, both by expoſing it to the ſun and by various liquors, it is proved that there does not exiſt a better nor a more laſting colour. It may for ſolidity be compared to the blues already mentioned. Nevertheleſs, the kermes is ſcarce ever uſed except at Venice; for ſince the fiery ſcarlets are become the taſte, this colour is almoſt entirely exploded. It has, notwithſtanding, many advantages over the other, as it neither blackens nor ſpots; ſo that ſhould the ſtuff get greaſed, the ſpot may be taken out without impairing the colour. Nevertheleſs, kermes is ſo little known to the dyers, that when I wanted a certain quantity for the above experiments, I was obliged to have it from Languedoc; the merchants of Paris encumber themſelves with no more than what they vend for the uſe of medicine.”

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The ſecond kind of ſcarlet, viz. that dyed with cochineal, is much more expenſive and leſs permanent than the other. For inferior uſes, ſuch as tapeſtry, the colour is ſometimes partly done with Braſil wood; but this colour cannot be made equally permanent with cochineal: and it is remarkable, that in whatever manner theſe fugitive colours be mixed with permanent ones, the latter never convey to them any portion of their durability, but, on the contrary, both go off together. The true cochineal ſcarlet is very difficult to dye in perfection, and almoſt every dyer has a receipt of his own for the purpoſe. The ſucceſs of the whole operation, however, according to Mr Hellot, depends upon the choice of the cochineal, the water uſed for dyeing, and the method of preparing the ſolution of tin, which is now univerſally known to be the only ingredient by which a ſcarlet colour can certainly be produced. The following is his receipt for the preparation of this liquid, which from his own experience he gives as the beſt. To eight ounces of ſpirit of nitre add as much river water, diſſolve in the mixture gradually half an ounce of very white ſal-ammoniac, in order to make an aqua regis, to which add two drachms of purified ſalt-petre. This laſt ingredient, he owns, might be omitted; but he is perſuaded that the uſe of it contributes to make the colour more uniform. In the liquor thus prepared diſſolve an ounce of Engliſh tin reduced into grains by dropping it, when melted, into a baſon of cold water. Theſe are to be dropped into the liquor one by one, waiting for the diſſolution of the firſt before we add a ſecond, in order to preſerve a quantity of red vapours, which are the phlogiſticated nitrous acid; and to the mixture of which he ſuppoſes the beauty of the colour is partly owing. The ſolution prepared in this manner is of the colour of ſolution of gold; and if fine tin be made uſe of, there is neither black duſt nor ſediment of any kind to be ſeen in it; but though tranſparent when juſt made, it is apt to become milky with the heats of ſummer; which, however, is no detriment to it in our author's opinion: and it is certainly juſt, if the tranſparency returns with the coolneſs of the ſolution. The aquafortis or ſpirit of nitre uſed for this purpoſe ought to be ſuch as will diſſolve half its weight of ſilver: and by following this method you will always be certain of having a compoſition of an equal ſtrength; ſo that any ſlight difference which may ariſe from the quality of the cochineal will ſcarce be perceived. A weak ſolution makes the ſcarlet incline towards crimſon, and a ſtrong one towards orange.

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When worſted is to be prepared for the ſcarlet dye, the following operation is neceſſary. For every pound of the ſtuff, ten gallons of clear river water are to be put into a ſmall copper; and when it becomes pretty hot, two ounces of cream of tartar, and a drachm and an half of cochineal, both finely ſifted, are to be added. A briſk fire is to be kept up; and when the liqour is ready to boil, two ounces of the compoſition already deſcribed muſt be added, by which the liquor is immediately changed from crimſon to blood colour. As ſoon as it begins to boil, the worſted, previouſly ſteeped in hot water, and then expreſſed, is to be added. It muſt be ſuffered to boil for an hour and an half; after which it is taken out, gently ſqueezed, and waſhed in cold water, having taken care to ſtir it conſtantly all the time. It will now be a tolerable fleſh colour, or even ſomewhat darker, according to the goodneſs of the cochineal and the ſtrength of the ſolution of tin; but the colour will be ſo totally abſorbed by the ſtuff, that the remaining liquid will be almoſt as colourleſs as water. This is called the *ſcarlet boiling;* and without this the dye would not hold. To finiſh the dye there muſt be another preparation of very clear water, the goodneſs of this being of the utmoſt conſequence to the goodneſs of the colour. In this preparation, along with the other ingredients, there muſt be half an ounce of ſtarch; and when the liquor is pretty hot, ſix drachms and an half of cochineal, likewiſe finely powdered, is to be added. A little before it boils, two ounces of the ſolution of tin are put in; by which, as in the former caſe, the colour is inſtantaneouſly changed. As ſoon as it begins to bubble, the worſted is to be dipped, allowed to boil an hour and an half, ſtirring it all the time, and then waſhing it as already directed. An ounce of cochineal will be ſufficient to give a proper depth of colour to a pound of wool; a drachm or two more might be added, if you would have the colour very deep, but if it be much enlarged, the dye will turn out very dull.

44 Proper material for the cauldron.

In dyeing the ſcarlet colour, the material of which the cauldron is made is by no means a matter of ſmall conſequence. On this our author has the following obſervations. "Their cauldrons in Languedoc are made of fine tin. They are alſo uſed by ſeveral dyers at Paris; but Mr Julienne, whoſe ſcarlet is very highly eſteemed, makes uſe of braſs cauldrons. Theſe are alſo uſed in the dyeing manufactory of St Dennis. Mr Julienne is careful only to ſuſpend a large packthread net, with pretty ſmall meſhes, in his cauldron, to prevent the ſtuff from touching. At St Dennis, inſtead of a net, they uſe a large open wicker baſket; but this is leſs convenient than the net, becauſe it requires a man at each ſide of the copper to keep it even, and to prevent it, when loaded with the ſtuff, from riſing to the ſurface of the liquor.

45 Experiment of M. Hellot on this ſubject.

"This practice, ſo different with regard to the materials of the cauldron, determined me to make an experiment. I took two ells of white Sedan cloth, which I dyed in two cauldrons, one of copper, furniſhed with a pack-thread net, and another of tin. I weighed the cochineal, the compoſition, and other ingredients, with as much accuracy as poſſible. They boiled exactly the ſame time. In ſhort, I was ſufficiently attentive to make the operation the ſame in every particular; that in caſe of any perceptible difference it could only be attributed to the different materials of the cauldrons. At the firſt boiling, the two patterns were abſolutely alike, except that the piece done in the tin cauldron was rather more marbled, and not quite ſo even as the other; but this in all probability might be occaſioned by their not having been equally cleanſed at the mill. I finiſhed each piece in its proper cauldron, and they were both of them very beautiful. Neverthelefs, it was very evident that the cloth which had been dyed in the tin was more fiery, and the other rather more crimſoned. They might have been eaſily brought to the ſame ſhade; but this was not my object. From this experiment, it appears that, with a copper cauldron, the quantity of the compoſition ſhould be increaſed; but then the cloth grows harſh to the feel. Thoſe who dye in copper, to prevent this evil add a little of the turmerick, which is a drug only uſed for falſe colours, and therefore prohibited by the regulations to dyers in grain, but which gives ſcarlet that dazzling fiery colour ſo much the faſhion at preſent. It is, however, if you have any ſuſpicion, eaſy to diſcover the deception, by cutting the pattern with a pair of ſciſſars. If it has no turmerick, the cut edge will appear white, othrewiſe it will be yellow. When the cloſe texture is equally dyed with the ſuperficies, let the colour be what it will, they ſay the colour *cuts*, and the contrary when the middle of the texture remains white. Legitimate ſcarlet never cuts. I call it *legitimate*, and the other falſe, becauſe that with the addition of the turmerick is more liable to fade. But as the taſte for colours is ſo variable, as the bright ſcarlets are at preſent the mode, and as it is neceſſary, in order to pleaſe the buyer, that it ſhould have a yellow caſt, it were better to authoriſe the uſe of the turmerick, though a falſe colour, than to allow too large a quantity of the compoſition, by which the cloth is injured, being more liable not only to dirt, but alſo to tear, as the fibres of the wool are rendered brittle by the acid.

"I muſt alſo add, that a copper cauldron ſhould be kept extremely clean. I have myſelf frequently failed in ſcarlet patterns by neglecting to clean the cauldron. I cannot in this place forbear condemning the practice even of ſome eminent dyers, who at about ſix o'clock in the evening make their preparation in a copper cauldron; and, in order to gain time, keep it hot till day-light the next morning, when they dip their ſtuffs. The preparation muſt undoubtedly corrode the copper during the night; and conſequently, by introducing coppery particles into the cloth, injure the ſcarlet. They will tell us that they do not put in the compoſition till immediately before the cloth is dipped: but this is no apology; for the cream of tartar added on the preceding evening being ſufficiently acid to corrode the copper, forms a verdigris which diſſolves, it is true, as ſoon as it is formed, but which nevertheleſs produces the ſame effect.

46 How to preſerve a tin cauldron from melting.

"As tin is abſolutely neceſſary in the ſcarlet dye, it were much better to have a cauldron of this metal, which would infallibly contribute to the beauty of the colour. But the price of theſe cauldrons, if ſufficiently large, is an object of conſideration, eſpecially as they may melt in the firſt operation if not carefully attended to by the workmen. Beſides, it would be very difficult to caſt a veſſel of ſo large a ſize without flaws that would require to be filled. It is abſolutely neceſſary that they be made of block tin. If the flaws ſhould be filled with ſolder, which contains a mixture of lead, many parts of the cauldron will retain the lead, which being corroded by the acid compoſition will tarniſh the ſcarlet. Hence there are inconveniences in every particular: nevertheleſs, if it were poſſible to procure a ſkilful workman capable of caſting a cauldron of the Melac tin without flaw, it were certainly preferable to every other; for though the acid of the compoſition ſhould in ſome parts corrode it, the detached particles will do no harm, as I have already obſerved.

"There is no danger of melting a tin cauldron, but when it is emptied in order to fill it with a freſh liquor. I ſhall therefore add the precautions neceſſary to prevent this evil. In the firſt place, the fire ſhould be taken entirely from the furnace, and the remaining embers quenched with water. Part of the liquor ſhould then be taken out with a bucket, while the remainder ſhould be daſhed about with a ſhovel by another perſon, in order to keep the upper part of the cauldron continually moiſt, at the ſame time cooling what remains in the cauldron with cold water. In this manner it ſhould be continued till you can touch the bottom without being burnt. It ſhould then be entirely emptied, and all the ſediment taken up with a moiſt ſponge. This attention will preſerve your cauldron.

47 Why wool in fleece is never dyed ſcarlet.

"Woollens are never dyed ſcarlet in the fleece, for the two following reaſons: The firſt is, or ought, to regard all ſtuffs of ſimply one colour; thoſe of many colours are called *mixed ſtuffs*. Theſe kind of ſtuffs are never dyed in the wool, eſpecially when the colours are bright and fine; becauſe, in the courſe of the fabrication, the ſpinning, twiſting, or weaving, it would be almoſt impoſſible to prevent ſome white or other coloured wool from mixing, which though ever ſo trifling would injure the ſtuff. For which reaſon, reds, blues, yellows, greens, or any of thoſe unmixed colours, ſhould not be dyed till after they have been manufactured. The ſecond reaſon is peculiar to ſcarlet, or rather to the cochineal, which being heightened by an acid, cannot ſtand the fulling without loſing much of its colour, or being at leaſt exceſſively crimſoned. For the ſoap which contains an alkaline ſalt deſtroys the vivacity produced by the acids. Hence it is evident that neither cloth nor ſtuffs ſhould be dyed ſcarlet till they have been fulled and dreſſed.

"To dye different pieces of cloth at the ſame time, the directions already given do not entirely anſwer.

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"For example, in order to dye five pieces of Carcaſſionne cloth at the ſame time, each piece five quarters broad, and fifteen or ſixteen ells in length, it is neceſſary to obſerve the following proportions: You begin by making the compoſition in a very different manner from the preceding proceſs, *viz.* twelve pounds of aquafortis put into a ſtone jar or glazed veſſel, with twenty-four pounds of water, and one pound and an half of tin grains added. The ſolution goes on more or leſs ſlow according to the acidity of the aquafortis, and ſhould ſtand for twelve hours at leaſt. During this time a kind of blackiſh dirt falls to the bottom; the top ſhould be then drained off the ſediment: this liquor is of a clear lemon colour, and is preſerved by itſelf. This proceſs evidently differs from the firſt by the quantity of water mixed with the aquafortis, and by the ſmall portion of tin, of which ſcarce any remains in the liquor; for the aquafortis not being in itſelf a ſolvent for tin, only corrodes and reduces it to a calx, provided neither ſaltpetre nor ſal ammoniac be added, which would convert it into an aqua regia. The effect of this compoſition is not, however, different from others, and is perceptible to thoſe who from experience are competent judges of this colour. The compoſition without ſal ammoniac has been for a long time uſed by the manufacturers of Carcaſſionne, who doubtleſs imagined that its effect was owing to a ſuppoſed ſulphur of tin, and may be preſerved from putrefaction for thirty hours in winter and only twenty-four in ſummer. It then grows turbid, forms a cloud, which falls to the bottom of the veſſel in a white ſediment. This ſediment is a ſmall portion of the tin, which was ſuſpended in an acid not prepared for the ſolution. The compoſition, which ought to be yellow, becomes clear as water; and if employed in this ſtate never ſucceeds, but produces the ſame effect as if it had been milky.

"When the compoſition is prepared, as I have now deſcribed, according to M. de Fondieres, you put, for the quantity of cloth laſt mentioned, about ſixty cubic feet of water into a large copper; when the water grows warm, you add a ſackful of bran: it is ſometimes neceſſary to uſe ſour water; they will either of them do, as they ſay, to correct the water, *viz.* to abſorb the terreous and alkaline ſubſtances, which crimſon the tinge of the cochineal. We ſhould be well informed concerning the nature of the water employed, in order to know whether theſe correctives be neceſſary.

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" Be it as it may, when the water is a little more than warm, you add ten pounds of cryſtals or cream of tartar pulveriſed, that is to ſay, two pounds to each piece of cloth. The liquor ſhould be then violently ſtirred; and, when rather hot, you ſhould put into it half a pound of the powder of cochineal, mixing it well together, and immediately afterwards you pour into it twenty-ſeven pounds of the compoſition, very clear, which alſo requires to be well ſtirred. As ſoon as it begins to boil, the cloth being immerſed, ſhould boil very faſt for two hours, and during that time ſhould be kept in continued motion on the wynch, and when taken out paſſing it through the hands by the liſting, in order to open and give it air. It is afterwards carried to the river and well waſhed.

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" In order perfectly to underſtand the method of ſtirring the cloth, it is requiſite to obſerve, that a kind of reel or wynch, with a handle for turning, ſhould be placed horizontally on the iron hooks which are fixed in the felloes that ſupport the edge of the cauldron. You firſt join the ſeveral ends of each piece of ſtuff to be dyed at the ſame time; and as ſoon as they are immerſed, you carefully keep the end of the firſt piece in your hand; you then lay it on the reel, which ſhould be turned till the end of the laſt piece appears. It is then turned the contrary way, and in this manner every piece will be dyed as even as poſſible.

" When the cloth has been well waſhed, the cauldron ſhould be emptied, freſh liquor prepared, to which you muſt add, if neceſſary, a ſack of bran or ſome ſour water; but if the quality of the water be very good, there is no occaſion for any addition. When the liquor is ready to boil, you put in eight pounds and a quarter of cochineal pulveriſed and ſifted. The whole is then mixed together as even as poſſible; but when you ceaſe to ſtir, you muſt mind when the cochineal riſes to the ſurface, forming a kind of ſcum of the colour of lees of wine. As ſoon as this ſcum begins to divide, you pour in eighteen or twenty pounds of the compoſition. You ſhould have a veſſel full of cold water near the cauldron ready to throw in, leſt after putting in the compoſition it ſhould riſe above the edge, as is ſometimes the caſe.

" When the compoſition is put into the copper, and the whole well mixed, you turn the wynch quick for two or three turns, that every piece may imbibe the cochineal equally. It is then turned more ſlowly, in order to let the water boil. It ſhould boil very faſt for two hours, conſtantly turning and keeping the cloth down with a ſtick. The cloth is then taken out, and paſſed through the hands by the liſting, in order to give it air and to cool it; it is afterwards waſhed at the river, dryed, and dreſſed.

" There is a conſiderable advantage in having a great quantity of ſtuff to dye at the ſame time; as for example, when the five firſt pieces are finiſhed there remains a certain quantity of the cochineal, which, ſuppoſing ſeven pounds at firſt, might amount to twelve ounces; ſo that cloth put into this ſecond liquor will imbibe the ſame ſhade of roſe-colour as if you had coloured a freſh liquor with twelve ounces of cochineal. The quantity remaining may, however, vary very much according to the quality of the cochineal, or according to the fineneſs of the powder. Though the quantity of colour remaining in the liquor may be very inconſiderable, it nevertheleſs deſerves attention on account of the dearneſs of this drug. Of this liquor, therefore, a preparation may be made for five pieces of cloth; and it will require leſs of the cochineal and leſs of the compoſition, in proportion, as near as you can gueſs, to the quantity remaining in the liquor. This is alſo a ſaving of fuel and time; but it is impoſſible to give poſitive directions concerning this manœuvre, which muſt be left to the ingenuity of the dyer; for having dyed roſe-colour after the ſcarlet, you may make a third preparation, which will dye a fleſh-colour. If there is not time to make theſe two or three preparations in 24 hours, the liquor ſpoils: ſome dyers put Roman alum into the liquor to prevent it from ſpoiling; but this changes it to a crimſon.

Scarlets crimſoned by alum.

" Scarlets thus crimſoned in the ſame liquor in which they had been dyed, are never ſo bright as thoſe done in a freſh liquor. Drugs which reciprocally deſtroy each other's effect are more efficacious when employed in ſucceſſion.

" When you dye cloth of different qualities, or any kind of ſtuffs, the beſt method is to weigh them, and for every hundred pound to allow about ſix pounds of cryſtals or cream of tartar, eighteen pounds of the compoſition in the preparation, the ſame quantity in the completion, and in each of them ſix pounds and a quarter of cochineal. For the accommodation of thoſe who would make ſmall experiments, the whole may be reduced, viz. one ounce of cream of tartar, ſix ounces of the compoſition, and an ounce of cochineal for every pound of ſtuff. Some of the Paris dyers ſucceed very well by putting two-thirds of the compoſition and a quarter of the cochineal in the preparation, and the remaining third of the compoſition, and the other three-quarters of the cochineal, to the completion.

" It is not the cuſtom to put cryſtal of tartars in the finiſh: I am however convinced by experience that it does no harm, provided that at moſt you put but half the weight of the cochineal; and in my opinion it made the colour rather more permanent. There have been dyers who have dyed ſcarlet at three times: in this caſe they had two preparations, and afterwards the finiſh; but they always uſed the ſame quantity of drugs."

We have already obſerved, that the kermes were ſo little uſed for brown or Venetian ſcarlets, that theſe kind of colours were made with cochineal. For this purpoſe the preparation is made as uſual; and for the dyeing they add to the liquor eight pounds of alum to every hundred weight of ſtuff. This alum is diſſolved in a ſeparate cauldron with a ſufficient quantity of water: it is thrown into the liquor before the cochineal. The remainder is done preciſely the ſame as in common ſcarlet: it gives the cloth the colour of Venetian ſcarlet; but it is not by any means ſo permanent as the colour obtained from kermes.

There are no alkaline ſalts that do not crimſon ſcarlet; but it is more generally the cuſtom to uſe alum, becauſe theſe alkaline ſalts are no addition to the permanency of the colour, and may poſſibly injure the ſtuffs, becauſe all animal ſubſtances are diſſolved by fixed alkalies. The alum, by being deprived of its phlegm by calcination, will more certainly crimſon. The liquor which had been uſed for crimſoning is red, and

and ſtill redder in proportion as the ſcarlet is more crimſoned, ſo that the colours part with much of their baſis in the liquor by which they are darkened. It is, however, impoſſible to darken in grain without ſalts. The late Mr Barron, in a memoir which he preſented to the Royal Academy of Sciences 12 or 15 years ago, remarks, that he ſucceeded better with the ſalt of urine, than with any other ſalt, for uniting the colour and preſerving its brightneſs and fulneſs; but, as he obſerved, it is very inconvenient to make any quantity of this ſalt.

51 Quality of the water uſed in ſcarlet of great importance.

It has been obſerved, that the choice of the water for dyeing ſcarlet was of importance; the greateſt part of the common waters ſadden, becauſe they almoſt always contain a quantity of ſtony or calcareous earth, and ſometimes of ſulphureous or vitriolic acid. Theſe are commonly called hard waters; by this term they mean water that will not diſſolve ſoap, and in which it is not eaſy to dreſs vegetables. By abſorbing or precipitating theſe heterogeneous ſubſtances, all waters are rendered equally good. If the matter be alkaline, a little ſour water will produce this effect. Five or ſix cubic feet of this ſour water, added to 60 or 70 cubic feet of other water before it has boiled, will cauſe the alkaline earth to riſe in a ſcum which may be eaſily taken off the liquor. A ſackful of any kind of white mucilaginous root cut in ſmall bits, or, if dry, powdered, will alſo, if the ſack be left to ſoak in the water for a half or three-quarters of an hour, correct a doubtful water; bran, as we have ſaid above, will alſo anſwer the ſame end tolerably well.

52 Of gum-lac ſcarlet.

The ſcarlet produced by gum-lac, though leſs bright than cochineal, has the advantage of being more permanent. The lac moſt eſteemed for dyeing is of a branched form. The colour is that of an animal, like that of cochineal and kermes, and the branched kind has moſt of the animal particles in it. The beſt kind is of a blackiſh brown colour on the outſide, and red within; and from ſome experiments made by M. Geoffroy, it appears to be a kind of comb, ſomewhat reſembling that made by bees or other inſects of that kind. Dyers ſometimes uſe it when pulveriſed, and tied up in a bag; but to this M. Hellot objects, becauſe ſome of the gum-reſin being melted by the heat of the boiling liquid, eſcapes through the cloth, and adheres to it ſo cloſely, that it muſt be ſcraped off with a knife when cold. Others endeavour to extract the colour by boiling it in water after it has been reduced to powder, and then letting it ſtand to ſettle, and pouring off the coloured liquid; but in this way it often turns putrid.

53 M. Hellot's method of extracting the colour of gum-lac.

M. Hellot, therefore, after ſeveral unſucceſsful trials to extract all the colour readily, had recourſe at laſt to mucilaginous roots; which, without communicating any colour of their own, retained that of the lac ſo effectually as to remain with it upon the filtre. Comfrey-root was that with which he ſucceeded beſt. For extracting the colour, he uſed it dried and powdered, in the proportion of half a drachm to a quart of water. In this it is to be boiled for a quarter of an hour; then ſtrained through a linen cloth, and poured while quite hot upon the gum-lac powdered and ſifted through an hair-ſieve. By this it immediately acquires a fine crimſon colour; after which the whole is ſet to digeſt in a moderate heat for twelve hours, ſtirring the gum which remains at the bottom ſeven or eight times. The water thus impregnated with the colour is afterwards decanted into a veſſel large enough to contain four times the quantity, which is then to be filled with cold water. A ſmall quantity of ſtrong ſolution of Roman alum is then added; the coloured mucilage ſubſides; and if any colour remains in the liquor, it may be precipitated by the addition of ſome more alum, until at laſt the water will be left entirely colourleſs. After the crimſon mucilage is entirely ſunk to the bottom, the clear water is drawn off with a ſyphon, and the remainder put upon a filtre, to let the liquid ſlowly drop off or evaporate. If the whole of the colour be not extracted from the lac by one operation, it is to be repeated till no more appears, and the reſiduum becomes of a pale ſtraw-colour. The beſt lac, detached from its branches, does not yield more than one-fifth of its weight in colour; and hence there is no great advantage to be made by ſubſtituting it in place of cochineal for the ſcarlet dye.

5 Med uſing extra gum-

For dyeing ſcarlet with this extract of gum-lac, the requiſite quantity of it, dried and powdered, is to be put into an earthen or block-tin veſſel. Some hot water is then to be poured upon it; and, when well moiſtened, add the proper quantity of the ſcarlet compoſition, ſtirring the mixture with a glaſs peſtle. By this means the powder, which before was of a dark dirty purple, acquires an exceedingly bright ſcarlet. The ſolution in which the cryſtals of tartar had been previouſly diſſolved is then to be poured into the liquor; and as ſoon as the latter begins to boil, the cloth is to be dipped into it, turning it over and over according to the common method. The remainder of the operation is to be performed in the ſame manner as if cochineal were uſed. The extract, in our author's opinion, afforded about a ninth part more colour than cochineal.

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Crimſon is the colour produced by cochineal with alum and tartar only, without any ſolution of tin. For this colour two ounces and an half of alum, with an ounce and an half of white tartar, are to be taken for every pound of wool. Theſe being put into a cauldron with a proper quantity of water, are to be made to boil before the ſtuff is put in. As ſoon as the liquor begins to boil, the wool is to be put into the cauldron, and the boiling continued for two hours; after which it is to be taken out, gently ſqueezed, rinſed in water, and put into a bag, which is alſo neceſſary to be done with the preparations for every other colour. A freſh liquor muſt be prepared for the dye, in which an ounce of cochineal is to be put for every pound of wool. When it begins to boil, the wool is to be put in, and managed as already directed for ſcarlet. For the fineſt crimſon, the ſtuff, after the common proceſs is finiſhed, ſhould be dipped in a new liquor in which a ſmall quantity of ſal ammoniac is to be diſſolved, and an equal quantity of potaſh added after it is pretty hot.

A very beautiful crimſon is obtained by boiling the wool as for common ſcarlet, then making a ſecond preparation with two ounces of alum, and an ounce of tartar to every pound of wool. It ſhould remain an hour in this decoction. A freſh liquor is then to be prepared immediately; in which to every pound of wool you put ſix drachms of cochineal. When it has remained an hour in this liquor, it is taken out and immediately dipped in a ſolution of barilla and ſal ammoniac;

moniac ; and in this manner a great number of very beautiful ſhades of crimſon may be prepared by diminiſhing the quantity of cochineal. In this proceſs it is neceſſary that the mixture of alkaline ſalt and ſal ammoniac ſhould not be too hot, as this would cauſe the volatile ſpirit evaporate too quickly, and the cryſtals of tartar alſo, being neutraliſed, would loſe their effect.

For dyeing ſilk of a fine crimſon with cochineal, M. Macquer recommends only 20 pounds of ſoap to 100 of ſilk ; " becauſe (ſays he) the little natural yellow ſtill remaining in the ſilk, after only this quantity of ſoap, is favourable to the colour.

" Having waſhed and beetled the ſilk at the river to diſcharge it well of the ſoap, it is put into a very ſtrong ſolution of alum, where it ſhould remain generally from night till the next morning, about ſeven or eight hours. The ſilk is then waſhed and twice beetled at the river ; during which time the following liquor is thus prepared :

" You fill a long boiler about one-half or two-thirds full of river water ; when this water boils, you throw in ſome white nutgalls pounded, letting it boil a little longer, about a quarter of an ounce to two ounces for every pound of ſilk. If the nutgalls are well pounded and ſifted, they may be put in at the ſame time with the cochineal.

" The ſilk being waſhed, beetled, and diſtributed upon the rods, you throw into the liquor the cochineal, carefully pounded and ſifted ; it muſt be then well ſtirred with a ſtick, and afterwards boiled. You may put from two to three ounces for every pound of ſilk, according to the ſhade required. For the moſt common crimſon colours two ounces and an half is ſufficient, it being ſeldom neceſſary to uſe three ounces except for ſome particular match.

" When the cochineal has boiled, you add to the liquor for every pound of cochineal about an ounce of the ſolution of tin in aqua regia ; it is called *compoſition*, and made in the following manner :

" One pound of the ſpirit of nitre, two ounces of ſal ammoniac, and ſix ounces of fine tin in grains : the two laſt are put into an earthen pot of a proper ſize ; twelve ounces of water is then poured on it, the ſpirit of nitre afterwards added, and the whole left to diſſolve.

" This compoſition contains much more tin and ſal ammoniac than is uſed for the ſcarlet of cochineal on wool ; it is however abſolutely neceſſary.

" This quantity of the compoſition ſhould be well mixed and ſtirred in the liquor, and the copper then filled with cold water, about eight or ten quarts to every pound of fine ſilk ; coarſe ſilk requiring leſs, as it occupies leſs ſpace. The liquor is then fit to receive the ſilk which is immerſed, and returned till it appears uniform, generally requiring about five or ſix returns. The fire is then ſtirred ; and whilſt the liquor is boiling, which it ſhould do for two hours, the ſilk is returned from time to time. The fire is then taken from under the copper, and the ſilk put to ſoak in the ſame manner as for aluming. It ſhould remain for five or ſix hours, or even, if the liquor be ready at night, till the next morning. It is then taken out, waſhed at the river, twice beetled, wrung as uſual, and put on the perches to dry.

" To ſadden the grain of ſcarlets, the ſilk when taken out of the cochineal liquor is waſhed and twice beetled at the river ; the water-liquor is then prepared, in ſummer as it is, but in winter a little warmed, adding a ſolution of copperas, more or leſs according to the darkneſs of the ſhade required. The ſilk ſhould be returned in this liquor, in ſmall hanks, till it becomes very even ; and when the ſhade is equal to expectation, ſhould be taken out, wrung and put to dry without waſhing if you like, becauſe the copperas liquor is little more than clean water. The copperas gives the cochineal a violet tinct, depriving it of its yellow. If, however, it ſhould appear to loſe too much of its yellow, it may be preſerved by adding to the copperas liquor a little of the decoction of fuſtic. Nothing but copperas will ſadden grain ſcarlets ; the logwood being quite uſeleſs for this purpoſe, copperas alone will ſuffice, as it darkens greatly with the nutgalls uſed in grain ſcarlets.

" The proceſs juſt related for producing this colour is the moſt in uſe at preſent, as it gives a more beautiful ſhade than can be obtained by any other method. Nevertheleſs, as many dyers proceed in the old way, we ſhall deſcribe it here.

" For theſe grain ſcarlets the round paſte, as imported from the Indies, is added in the boiling of the ſilk. When the ſoap boils, about an ounce of rocou is bruiſed in the cullender, in the ſame manner as deſcribed for orange-colours. It ſhould be pounded as fine as poſſible, leſt any lumps ſhould remain and ſtick to the ſilk.

" This ſmall quantity of rocou, in the boiling of the ſilk, has the ſame effect as the compoſition, yellowing a little. The remainder of this proceſs is juſt the ſame as the preceding ; but without the addition of either compoſition or tartar.

" The ſilk dyers are accuſtomed to uſe only the fineſt cochineal, and even always prefer the prepared cochineal, which is cleanſed from all its impurities, ſifted and picked. This is certainly commendable, conſidering that the cochineal not prepared being leſs pure, the more of it muſt be added, and that the dregs remaining in the liquor may injure the colour. The white tartar uſed in grain ſcarlets ſerves to exalt and yellow the colour of the cochineal, producing this effect by its acidity, all acids having the ſame effect : we muſt, however, obſerve, that tartar is preferable, as it gives a more beautiful tinct. But, notwithſtanding the quality of the tartar, it is ſtill incapable of exalting the colour of the cochineal ſufficiently to produce a grain ſcarlet, whatever quantity may be added if employed by itſelf : for if the doſe of this ingredient be moderate, it will not yellow enough ; and if too large, it deſtroys and degrades the colour, without any good effect. In order to aſſiſt the tartar, it will be neceſſary to add ſome of the compoſition, which, as we have ſeen, is nothing more than a ſolution of tin in aqua regia. This ſolution with cochineal, when uſed for dyeing of worſted, has a conſiderable effect, changing it from a crimſon, its natural colour, to a prodigious bright fire colour ; and produces only a crimſon when applied to ſilk : but it gives this colour a very beautiful tinct ; for uniting with the tartar, it augments the effect without impoveriſhing the colour, ſaving the rocou ground, as we have before obſerved.

" As

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Uſe of nutgalls in dyeing ſilk of a crimſon colour.

" As to nutgalls, they produce no good effect with regard to colour: on the contrary, if you uſe too much, they tarniſh to a degree, entirely ſpoiling the colour; nevertheleſs, it is always the cuſtom to put the quantity we have ſpecified.

" One might probably conjecture from the introduction of this practice, that ſcarlets were formerly produced with cochineal, without either tartar or compoſition, yellowing only with rocou: ſilk dyed in this manner, however, would have no ruſtling, ſo that it could not be diſtinguiſhed from ſilk dyed with Braſil wood. Nutgalls, on account of their concealed acid, having the property of giving the ſilk a great ruſtling, are therefore added with cochineal; by which means theſe ſcarlets are diſtinguiſhed by the feel from the ſcarlet of Brazil wood: for we muſt obſerve, that the Braſil dye cannot ſtand the action of the nutgalls, by which it is entirely deſtroyed.

" But beſides giving this ruſtling to the ſilk, it has at the ſame time the ſingular and very remarkable quality of adding to its weight very conſiderably; ſo that by putting one ounce of nutgalls to every pound of ſilk, you add two or two and a half *per cent.* to the weight: by this means ſome ſilk-dyers add even ſeven or eight *per cent.* They are ſo much accuſtomed to this advantage in weight, owing to the nutgalls, that even when this drug becomes uſeleſs by the addition of the tartar and compoſition, which produces the ſame ruſtling, they make it ſtill neceſſary on account of the weight, which is not proportionably increaſed by the other acids. White nutgalls are always preferable to the black, as they injure the colours much leſs. We may, however, hence conclude, that for grain ſcarlets nutgalls are not only uſeleſs but very prejudicial; and ſerving only as an impoſition, is a blameable practice, and injurious to commerce.

" The ſilk is thus ſuffered to remain in the liquor, in order to make it wholly imbibe the cochineal. During this repoſe it takes a good half-ſhade; and the colour yellowing in proportion, gives it a much finer caſt.

" One would be apt to believe, that leaving the ſilk to boil in the liquor for a longer time would have the ſame effect; but experience proves the contrary: beſides, it would be more expenſive, conſidering that it would be neceſſary to continue the fire.

" The cochineal leaves on the ſilk, when taken out of the liquor, a kind of ſcale, or rather the ſkin of the inſect, which always contains a portion of the colouring juice. In order, therefore, to cleanſe the ſilk perfectly from this kind of bran, it is twice beetled when waſhed at the river. By this means the colour becomes more brilliant, clearer, and fuller.

" The two beetlings before dyeing are neceſſary, becauſe the ſilk having been ſtrongly alumed for this colour, and intended to boil in the dyeing liquor for a great while, would, without this precaution, yield a certain quantity of the alum, which not only injures the colour, but likewiſe prevents the perfect extraction of the cochineal; for generally all neutral ſalts added to the dyeing liquor have more or leſs this inconvenience.

" The grain, or cochineal crimſon, ſuch as deſcribed, is not only a very beautiful, but may be conſidered as a moſt excellent colour: it is the moſt permanent of all dyes for ſilk. It perfectly reſiſts the boiling with ſoap, and evidently ſuffers no alteration from either the ſun or the air. Silk ſtuffs of this colour, commonly uſed in furniture, are ſooner worn out than faded. It is frequently ſeen that the colour of this grain crimſon in furniture, though more than 60 years old, is ſcarce impaired. The only obſervable difference occaſioned by time is, that by loſing the yellow caſt it becomes rather darker, approaching nearer to the violet."

Of
cott
red

The dyeing of cotton red is attended with much more difficulty than any of the ſubſtances hitherto mentioned; and indeed to produce a good ſcarlet or crimſon upon it has hitherto been a deſideratum in the art. The following are M. Apligny's directions for dyeing ſuch reds as are commonly in uſe. " It is neceſſary, previous to the dyeing of cotton thread, to cleanſe it from that unctuous matter by which the dye is prevented from penetrating its pores. For this purpoſe they make uſe of ſour water; which is prepared by throwing ſome handfuls of bran into hot water, and letting it ſtand 24 hours, or till the water becomes ſour, when it is fit for uſe. Theſe ſour waters, however, cleanſe the cotton but very imperfectly, carrying off only the ſuperficial part of the unctuous matter, which river water would do as well. The lixiviums of aſhes are more effectual; and therefore all fixed alkalies, particularly kelp, or even the aſhes of new wood, are, for the reaſon I have already given, generally preferred for this operation. The ſalts are extracted in the ſame manner as by the bleachers; and the cotton is then ſteeped in theſe lixiviums, which, like the ſilk, is incloſed in a clean linen pocket or ſack, to prevent the ſkeins from tangling: it ſhould boil for a couple of hours: when perfectly cleanſed, the pockets ſink to the bottom of the liquor, becauſe the impeding matter being removed, the water penetrates the pores. The pocket is then taken out of the copper, the ſkeins ſeparated from each other, and waſhed at the river. They are afterwards wrung on the peg, and again rinſed till the water comes off clear. The ſkeins are then ſpread on the perches to dry.

" To dye cotton red requires three preparations, viz. cleanſing, galling, and aluming. The operation of cleanſing as above.

" With regard to the galling, any kind of galls may be uſed in caſe of neceſſity; or even tan may be ſubſtituted; but that requiring more, it would not anſwer the purpoſe ſo well. The black Aleppo galls, becauſe leſs ſuffices, are preferable to the white galls, which though cheaper make the expence come nearly equal. The Aleppo galls are, however, liable to dull the colour, which though eaſily revived, the white not producing this inconvenience, are generally preferred by moſt dyers. It requires nearly five quarts of liquor to drench one pound of cotton; ſo that for 20 pounds, five pounds of pounded galls are boiled in about 120 quarts of water; it ſhould boil for two hours, or till by preſſing it between the fingers it breaks eaſily.

This liquor is drawn off clear, and poured into a tub, into which, when cold, or even whilſt warm, the cotton, which was before divided into hanks of about eight ounces each, and tied with a thread to prevent them from tangling, is dipped. Suppoſe, for example, that having about 40 of theſe hanks, and 100 quarts of the gall liquor, a part of it neceſſarily evaporating

rating in the boiling, five quarts of this liquor is taken out of the tub and put into a trough, into which you dip two ſkeins at once, carefully working them till they are ſoaked. They are then taken out and laid in an empty tub, pouring over them the remainder of the liquor in which they had been ſoaked: five quarts more are then taken out of the tub containing the gall water, poured into the trough, and two more hanks dipped into it, and ſo on ſucceſſively till the whole is galled. The gall liquor ſhould be ſtirred in the tub every time you take out, that the whole of the cotton may be galled equally, which it would not be were the grounds to ſettle at the bottom. This operation finiſhed; if any of the liquor remains, it is poured on the galled cotton, being orderly ranged in the tub; where, after remaining 24 hours, it is taken out ſkein by ſkein, gently wrung, and then put to dry.

" The aluming for the cotton conſiſts of about four ounces of Roman alum for every pound of the ſubſtance. Having pounded the proper quantity of alum, it is diſſolved over the fire in a copper containing a ſufficient quantity of water, taking care not to let it boil, otherwiſe it would loſe its ſtrength. The liquor is immediately poured into a tub or trough of cold water, proportioned to the quantity of the cotton, ſo as that the whole of the liquor may be as that of the galling, 100 quarts for every 20 pounds of cotton. It is the cuſtom to add to this alum liquor a ſolution partly compoſed of arſenic and white tartar, with one part of the lixivium of kelp. The firſt ſolution conſiſts of one grain of arſenic and two grains of white tartar, in two or three quarts of water. When the water in the copper boils, the arſenic and tartar, well pounded, is put into it, and kept boiling till the liquor is reduced to about half. When cold, it is ſtrained and put into bottles or veſſels, which ſhould be ſtopped and kept for uſe.

" The kelp lixivium is made with about half a pound to a quart of water. You will know if this lixivium be ſufficiently ſtrong, when by putting an egg into it the point only appears on the ſurface.

" You then add to the alum liquor for this ſuppoſed 20 pounds of cotton 20 quarts of the ſolution, and three quarts of the ſaid lixivium, obſerving nevertheleſs that the whole of the water uſed in mixing the alum and other ſubſtances be always in the proportion of five quarts of liquor to every pound of cotton. The 20 pounds of cotton are then plunged into this aſtringent pound by pound, in the ſame manner and with the ſame precaution as in galling; it is afterwards wrung, but without being too much ſqueezed, and then ſlowly dried.

" Some dyers never uſe the ſolution of tartar and arſenic with the alum, rationally ſuppoſing that theſe ſubſtances, as they ruſt and yellow the red colours, would be prejudicial to the dye: the red furniſhed by madder, being already too much inclined to this ſhade, requires rather to be ſaddened; and for this reaſon partly the kelp lixivium is added to the aluming. Several, therefore, uſe ſix quarts of this lixivium inſtead of three; and theſe ſix quarts containing the ſalts of about three pounds of kelp, which by ſuppoſing the kelp aſhes to contain a quarter of its weight of ſalt, is in proportion of half an ounce to every quarter of a pound of alum.

" Inſtead of the ſolution of tartar and arſenic, others make uſe of a ſolution of ſugar of lead, prepared ſeparate. It ſhould be obſerved in this particular, that when the ſugar of lead is diſſolved in common water, it becomes turbid and whitiſh, becauſe plain water not diſſolving this perfectly, a kind of partial ſeparation of the calx of lead takes place; but by mixing a ſufficient quantity of diſtilled vinegar with the water, the calx entirely diſappears and the ſolution is complete.

" When the cotton is taken out of the aſtringent, it is lightly wrung on the peg, and dried. The more ſlowly it dries, and the longer before it is maddered, the brighter the colour. Twenty pounds of cotton are generally dyed at the ſame time; but it were ſtill more advantageous to dye only 10, becauſe when there are two many hanks to work in the copper, it is very difficult to dye them equally, the hanks firſt immerſed having time to take a great deal of colour before the laſt are put in; for as the firſt cannot be returned upſide down till after the laſt are plunged, it is morally impoſſible that the dye ſhould be even.

" The copper in which this ten pounds of cotton are dyed ſhould contain about 240 quarts of water,—that is, 20 quarts of water for every pound of cotton; its ſhape ſhould be an oblong ſquare, and about two feet deep. It ſhould alſo be wider at top than at bottom; the difference, however, ſhould not be too great, becauſe in that caſe the hanks laid ſlanting on the ſides would be liable to ſpot. As ſeveral dyers have erred for want of knowing how much water the copper ſhould contain reſpecting its dimenſions, and as the greater part of the braſiers are likewiſe ignorant in this particular, it may not be amiſs, in this place, to add a ſhort and eaſy method of finding the contents of a veſſel.

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Ready method of finding the contents of a veſſel.

" In the firſt place, ſuppoſe the veſſel round or cylindrical, you begin by meaſuring the diameter; you then ſeek the circumference, afterwards the ſurface; and at laſt, by multiplying the ſurface by the perpendicular height, the product is the cube ſought for, and determines the contents of the veſſel.

" For example, a copper 22 inches deep by 30 diameter; to find the ſurface, take the proportion of the diameter to the circumference, which is as 7 to 22: ſtate as in the Rule-of-Three, the firſt number 7, the ſecond 22, and the third 30; the fourth number will be the circumference. This fourth number is found by multiplying the two middle numbers, 22 and 30, by each other, and dividing the product 660 by 7, the firſt number; the quotient 94 is the circumference ſought for. If a ſquare or oblong veſſel, as in the preſent caſe, you have the circumference by adding the length of the four ſides.

" Multiply afterwards the half of the circumference by the radius, that is 47 by 15, the product 705 is the number of ſquare inches, and conſequently the ſurface of your veſſel.

" At laſt multiply 705 by 22, which is the perpendicular height, the product 15510 is the number of cubic inches your veſſel contains. If it is larger at top than at bottom, it is neceſſary, in order to determine the circumference, to take a middle number between the breadth of the top and the breadth of the bottom, as if the copper be 33 inches at the top and at bottom 27, the middle number and real diameter is 30.

" Having multiplied the ſurface by the perpendicular height, you muſt reduce the inches to feet. Now the

the ſquare foot being equal to 144 ſquare inches, and the cubic foot to 1728 cubic inches; you muſt therefore in this example divide 15510 by 1728, the quotient $9\frac{1}{11}$ will be about the number of cubic feet in the copper; and as a cubic foot contains 35 quarts, conſequently the copper contains 318 quarts Paris meaſure. (The Paris pint is our quart.) To madder 10 pounds of cotton, a copper containing 248 quarts of water is made hot. When it is rather too hot for the hand, ſix pounds and a quarter of good Dutch grape madder is put into it, and carefully opened and diffuſed in the liquor. When it is well mixed, the cotton, which had been previouſly paſſed on the rods and ſuſpended on the edge of the cotton, is dipped into it hank by hank. When it is all dipped, the hanks on each rod are worked and ſucceſſively turned upſide down, beginning from the firſt that was put in, and ſo proceeding to the laſt; returning to the firſt, and thus continuing without intermiſſion for three quarters of an hour, always maintaining an equal degree of heat, but without boiling. The cotton is then raiſed and drawn out upon the edge of the copper, and about a pint of the kelp lixivium poured into the liquor. The rods are then paſſed through the threads by which each hank is bound, and the cotton put back into the copper and boiled for about 12 or 15 minutes, keeping it entirely immerſed during that time. It is at laſt raiſed, gently drained, wrung, waſhed at the river, and wrung a ſecond time on the peg.

"Two days afterwards the cotton is a ſecond time maddered, about eight ounces of madder to every pound; that is, five pounds of madder added to the dyeing liquor. The cotton is then worked in it in the ſame manner as in the firſt maddering, with this difference, that none of the lixivium is added, and that the liquor is made of well-water. This maddering being finiſhed, and the cotton cooled, it is waſhed, wrung, and dried.

"To brighten this red, you put into a copper or trough a quantity of warm water ſufficient to drench the cotton, pouring into it about a pint of the lixivium. In this liquor you immerſe the cotton pound by pound; leaving it in for an inſtant only, when it is taken out, wrung, and dried.

"On this operation it ought to be obſerved, that the method of dyeing in two liquors has no advantage. For, beſides that it conſumes more time and wood, the ſecond maddering cannot furniſh much dye, conſidering that the aſtringent ſalts are exhauſted by the boiling of the firſt maddering; conſequently that the cotton, when deprived of theſe ſalts, cannot take the dye. I propoſe therefore another method now purſued with ſucceſs by ſeveral dyers: it conſiſts in giving the cotton two alumings, and afterwards dyeing in one liquor only. By this means it takes the dye much better, and acquires more depth, becauſe the whole of the madder turns to advantage. With reſpect to brightening, it is a needleſs operation for red cotton deſtined for the fabrication of callico; becauſe the colour is brightened after it is woven, by dipping in warm water ſharpened with a little of the lixivium. When the cotton is taken out of this water, if waſhed at the river and ſpread on the graſs, the red brightens much better than by any other operation.

"The reds hitherto mentioned are vulgarly called *madder reds*, though thoſe I am going to deſcribe are equally obtained from a ſpecies of madder coming from the Levant. The latter, however, commonly called *lizary*, furniſhes a dye incomparably finer than that produced by the beſt Zealand madder: it is, however, the faſhion to call the red of madder the firſt dye, and the Adrianople red the ſecond. The proceſs of the latter I ſhall give in this place.

"When you have 100 pounds of cotton to dye, you put 150 pounds of Alicant ſoda, incloſed in clean linen, into a tub. This tub ſhould be full of holes at the bottom, that the liquor may run into another tub underneath. The 150 pounds of ſoda being in the upper tub, is covered with 300 quarts of river-water, meaſured by wooden pails containing each 25 quarts. The water that paſſes from the firſt tub into the ſecond is again poured over the ſoda at different times, till it has extracted all the ſalt. This lixivium may be tried with oil: if it uniformly whitens, and mixes well with the oil without any appearance of ſeparation at the ſurface, it is then ſufficiently ſaturated with the ſalt. It may be alſo tried with a freſh egg, as I have ſaid above. You again pour 300 quarts of water over the ſoda contained in the ſuperior tub, in order to extract the whole of the ſalt. Two ſimilar lixiviums are afterwards made, each with the ſame quantity of water as had been uſed for the ſoda, *viz.* 150 pounds of freſh wood-aſhes, and the other with 75 pounds of quicklime. Theſe three lixiviums being clarified, 100 pounds of cotton are put into a tub, and watered with each of theſe lixiviums in equal proportion. When it has perfectly imbibed theſe ſalts, it is put into a copper full of water without being wrung, and boiled for three hours: it is afterwards taken out and waſhed in running water. This operation being finiſhed, the cotton is dried in the air.

"A quantity of the above-mentioned lixiviums is then poured into a tub in equal portions, ſo as to make 400 quarts. In a part of this liquor, 25 pounds of ſheep's dung, with ſome of the inteſtine liquor, is well diluted by means of a wooden peſtle, and the whole ſtrained through a hair-ſieve. Twelve pounds and a half of good olive-oil poured into this mixture, when finiſhed, inſtantly forms a ſoapy liquor. In this the cotton ſhould be dipped, hank by hank, ſtirring every time, and with the ſame precautions I have already recommended in the aluming of cottons deſtined for the madder red. The cotton having remained 12 hours in this ſoapy water, is then taken out, lightly wrung and dried. This operation is repeated three times. The liquor that runs from the cotton when wrung falling again into the trough where the cotton was laid is called *ſickiou*, and ſhould be kept for brightening.

"When the cotton has been three times dipped in this ſoapy water, and afterwards dried, it is again dipped three times in another compoſition, made in the ſame manner as the firſt, with 400 quarts of lixivium and 12½ pounds of oil, but without the ſheep's dung: the remainder of this liquor is alſo preſerved for brightening. The cotton having been dipped in this liquor three times with the ſame precautions, and left in it the above-mentioned time, it is then carefully waſhed at the river to diveſt it entirely of the oil, without which the aluming would not take effect. Having been

waſhed,

waſhed, it ſhould be as white as if it had been bleached.

“ When dry, you proceed in the aluming, which is done twice ſucceſſively: but it is needleſs to give a detail of what has been ſufficiently explained in the article upon madder red. It is enough in this place to ſay, that the galls, about a quarter of a pound to every pound of cotton, ſhould be pulverized; that ſix ounces of alum ſhould be put to the firſt aluming; for the ſecond four ounces; and at laſt, that an equal quantity of the lixivium be added to the alum-water. We muſt alſo obſerve, that it were beſt to make an interval of three or four days between each aluming; and that no other aſtringent be added, all metallic ſalts being in general injurious to the beauty of the colour.

“ Some days after the laſt aluming, you proceed to dyeing in the ſame manner as above, only uſing two pounds of lizary in powder for every pound of cotton; and, before you dye, adding to the liquor about 20 pounds of liquid ſheep's blood. It ſhould be well ſtruck into the liquor, which ſhould be carefully ſkimmed.

“ In order to brighten the colour, the cotton is dipped in a lixivium of freſh wood aſhes, diſſolving in it five pounds of the beſt white Marſeilles ſoap; the water ſhould be warm before the ſoap is put into it. In this mixture the 100 pounds of dyed cotton is immerſed, and worked till it becomes perfectly penetrated. Six hundred quarts of water are then put into another copper; and when warm, the cotton, without ſqueezing it out of the firſt, is put into the ſecond, and boiled for three, four, five, or ſix hours, over a very ſlow fire, but as equal as poſſible, carefully covering the liquor to keep in the vapour, that none may eſcape but what paſſes through a funnel of ſmall reeds.

“ Some pieces of the cotton are taken out from time to time; and when ſufficiently revived and waſhed thoroughly, the red is perfect. The cotton may be alſo brightened in the following manner: when waſhed and dried immediately after dyeing, it ſhould be ſoaked in the ſickiou for an hour, well ſqueezed, and alſo dried. When dry, you diſſolve for every 100 pounds of cotton 5 pounds of ſoap in a quantity of water ſufficient to cover the cotton. When the water is warm, the cotton is immerſed; and having well imbibed, is put into a copper with 600 quarts of water. The whole is boiled very ſlowly during four or five hours, keeping the copper covered to prevent the ſteam from going off. This ſecond method makes the red much brighter than the fineſt Adrianople carnation.

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“ The proceſs juſt deſcribed was practiſed at Darnetal, and in other manufactories of France, according to inſtructions communicated by a perſon who had ſeen this proceſs in Turkey. But whether his obſervations were inaccurate, whether he concealed a part of the myſtery, or whether the ſucceſs of the operation depended on the concurring circumſtances accompanying the various mixtures, I know not. Few, however, by cloſely obſerving this proceſs, have hitherto obtained a red either ſo permanent or ſo beautiful as the red of Adrianople, and thoſe who have ſucceeded think it but juſt to reap the advantage of their ſecret. On this ſubject, however, ſeveral not unuſeful reflections may be advanced.

61
Obſervations of M. de Apligny upon it.

“ Firſt, the manner of purging the cotton indicates that this proceſs is capable of damaging conſiderably, and of rendering the cotton very brittle, owing to the ſharpneſs of the lixivium in which it is ſteeped, ſo burning in its nature as to make holes in the legs of the workmen who tread it with their feet. It is therefore more ſimple and leſs dangerous to cleanſe the cotton in ſix quarts of lixivium to every pound of ſubſtance, and containing only ſix ounces of kelp for every ſix quarts; to boil the ſkeins in it afterwards, incloſed in clean linen pockets.

“ By this method the cotton would be ſufficiently cleanſed without being ſpoiled; the kelp may be even reduced to half the quantity, ſubſtituting in its place double its weight of freſh wood aſhes, which would anſwer quite as well.

“ Secondly, that the failure of many dyers is owing to their not ſufficiently diveſting the cotton of the oil, which prevents both the galling and aluming from taking effect. The mixture of the lixivium and oil not being well made, or the lixivium being too weak, the oil forms with it but an imperfect combination. This oil therefore, ſeparating and ſwimming on the ſurface of the lixivium, ſticks to the cotton, which it greaſes, and by obſtructing the pores prevents the gall from penetrating. Great attention therefore ſhould be given to the lixivium, in order to extract all the ſalt of the kelp, and to uſe quicklime, which is abſolutely neceſſary to render this lixivium cauſtic; a quality without which the oil cannot poſſibly form a combination with the alkali, conſequently can make no ſoap.

“ In Europe the oil of olives is ſubſtituted inſtead of the oil of ſeſamum, which is uſed in the Eaſt-Indies and in Turkey; but the nature of theſe oils makes no difference in the operation. The oil of ſeſamum differs from the oil of olives only becauſe it is thicker, conſequently nearer to the nature of animal fat or wax; but the concluſion reſulting from this difference is, that leſs of it may be required than of the oil of olives. Were the oil of ſeſamum abſolutely neceſſary, it might have been eaſily procured. The ſeſamum is a ſpecies of fox-glove that grows in the Indies; but is cultivated in Italy, and eſpecially in Sicily, where it is called *giurgulena*. The ſame kind of oil may be obtained from plants analogous; ſuch as the gratiole, the henbane, &c. but the plant whoſe ſeed reſembles it moſt is the convolvulus or lizeron.

“ It is certain that the proceſs brought from Adrianople might be greatly abridged; but we muſt leave the ſecret to thoſe to whom it belongs: and I am beſides convinced, that a memoir on this ſubject will be preſented to the Academy of Sciences, and therefore will not anticipate.

“ With regard to the ſheep's dung and inteſtinal liquor, it is of no uſe in fixing the colour. But we know, that theſe ſubſtances contain a large quantity of volatile alkali quite developed, which has the property of roſing the red colours. If the bones of animals owe to their tenacious gluten the faculty of retaining ſo ſtrongly the madder colour, the vivacity of this colour may be attributed, as from experience we learn, to their volatile alkali. It were abſurd to imagine that the Europeans only had diſcovered this phenomenon; as it may be rationally ſuppoſed, that the Indians, having perceived it by accident, ſought to imitate what chance had brought to their knowledge. It is certain, that in the red dye of the Maroquins, the proceſs of which was brought from the Levant, they prepared the goat ſkins for dyeing with dog's excrement, having found it effective in exalting the dye of the lac.

" In the dyeing of cotton thread, it is common to mix the ſheep's dung with a lixivium of fixed alkali; by which the volatile principle of the dung is retained, and conſequently putrefaction prevented. By dipping the cotton ſeveral times in this ſoapy liquor, it is impregnated with the predominating alkaline principle; and we know by experience, that ſubſtances once impregnated with volatile alkali, for example, chemical veſſels uſed in extracting it for a long time, retain a ſmell very like the ſmell of muſk, even after having been well ſcrubbed with ſand, aſhes, ſoap, &c. Every time the cotton is dried when taken out of this liquor, the evaporation of the aqueous particles (the alkaline principles being changed into earth) produces a ſtronger adheſion in the pores of the cotton. From the union of this earth with a portion of the oil employed, a maſtic is the reſult, which is afterwards completed by the alum; and this, in a word, is the theory of the fixity of this colour.

62
Of the dyeing of linen.

" Linen thread may be dyed in the ſame manner; only that, previous to its being purged like the cotton thread, it is uſual to boil it in water, adding for every pound of thread a quarter of a pound of chopped ſorrel. Oil of vitriol is, however, more convenient and better than ſorrel. But I refer my reader to what I have already ſaid upon the article of thread; obſerving only, that by this proceſs the linen thread always takes leſs dye than the cotton, owing to the difference of their pores.

63
Method of dyeing crimſon in the Eaſtern countries.

The following proceſſes were taken from the manuſcripts of M. Hellot. " According to the letters of M. Grange, correſpondent of the Royal Society, who died at Schiras in Perſia, June 1737 the dyers of the city of Damas dyed their crimſon colour, ſo beautiful and ſo much eſteemed in the eaſt, in the following manner: Take ten *rottes* (a rotte weighs five pounds) of ſilk in ſkeins; waſh it well in warm water; then let it ſoak in a ſufficient quantity of hot water during half an hour; ſqueeze out the water; dip it afterwards, but once only, in a hot lixivium, made with a ſufficient quantity of water, half a *rotte* of kelp aſhes for every rotte of ſilk, which is immediately drained on rods, taking care not to leave the ſilk longer in the lixivium than is neceſſary for its being well ſoaked, leſt the alkali ſhould corrode it.

" Whilſt the ſilk drains, they prepare another liquor cold, with ten ounces of the pulp of yellow melon, very ripe, which is uniformly diffuſed in a ſufficient quantity of water. They ſteep in this liquor the ten *rottes* of ſilk for twenty-four hours; they increaſe or diminiſh the quantity of the above drugs in proportion to the quantity of the ſilk to be dyed. The ſilk having remained one day in this melon liquor, is ſeveral times waſhed in freſh water till it becomes perfectly clean; they then hang it to dry. Mean while the workmen fill a large pan of water, adding a half *rotte* of alum powdered for every *rotte* of ſilk. The pan is then ſuſpended over a hot furnace, and the liquor boiled during twenty minutes; after which the fire is taken from the furnace. The ſilk is then dipped in this alum ſolution, moderately hot, and again taken out as ſoon as it is perfectly wet. They then put it into another pan, pouring over it the alum ſolution, in which it remains four or five hours, but no longer. It is then taken out and ſeveral times waſhed in freſh water.

" Whilſt the ſilk is waſhing, a workman fills a large pan with water, adding an ounce of *baiſonge* (a fungus), finely powdered, for every rotte of ſilk; when this new decoction has boiled for half an hour, they add ten ounces of *oudez* (cochineal), very finely powdered, for every rotte of ſilk; that is, ſix pounds four ounces of cochineal for ten rottes of ſilk. As ſoon as this cochineal is added, the fire is taken from the furnace. The liquor is then gently ſtirred round with a ſtick; and when the mixture is perfectly made, they pour gently and by inclination a little freſh water into the middle of the pan. The water thus added not only cools the dye, but makes it much more lively. They then immediately dip the ſilk four or five times, wringing after every dip. This tincture is afterwards boiled again for about a quarter of an hour, and the fire is then taken from the furnace as before. When the liquor is a little cool they dip the ſilk, ſtill obſerving to wring after every dip. This done, they put the ſilk into an empty kettle, pouring over it the remainder of the dye, in which it is left to ſoak for twenty-four hours. It is then well waſhed in clean water, dried in the ſhade, and when very dry wove into ſtuffs. This crimſon is much ſuperior to all the French and Italian crimſons; becauſe the ſilk was never boiled in the dye.

"The dyers of Damas and Diarbequir ſay, that they could not accompliſh this dye without the pulp of the yellow melon in the preparation, or without the *baiſonge* uſed with the cochineal in the dye. According to M. Grainge, we have this melon in France; but he doubts concerning the *baiſonge*, which is a ſpecies of fungus growing on trees in ſome parts of Perſia, from whence it is brought to Damas, and might alſo be ſent into France by the way of Aleppo, were we deſirous of imitating this excellence in the crimſon dye.

" To avoid miſtakes in the quantity of the different ingredients employed in this proceſs, it may be neceſſary to repeat, that a rotte of ſilk weighs five French pounds, and that the ten rottes of ſilk, produced as an example in this memoir, ſhould alſo ſerve as a ſtandard with regard to the quantities of the other ingredients.

" As to the water neceſſary for the preparation of the ſilk with the kelp, melon, and the alum for the dye, it requires no more than a ſufficient quantity for wetting the ſilk, namely, about a finger's breadth over it, differing from the tincture, which as the ſkeins are dipped in this liquor at leaſt ten or a dozen times, ſhould be fuller in the kettle.

" The kali uſed in the preparation of the ſilk is nothing more than the aſhes of a plant called by the

Arabs

Arabs *kailou*. Theſe are preferable to the aſhes made from the *rouquet*, or thoſe made in Egypt.

" The frames uſed for theſe ſilks are ſimilar to the frames uſed at Lyons.

" At Genoa the ſilks deſigned for crimſon are boiled in a much leſs quantity of ſoap than thoſe intended for any other colour, 18 or 20 pounds ſerving for a hundred pounds of ſilk in the crimſon dye; for any other colour, the Genoeſe uſe 40 or 50.

" When the ſilk is boiled, it is dipped in the alum liquor; and to a quantity of raw ſilk, weighing 72 pounds, they put from 16 to 18 pounds of roch alum, finely powdered, into a copper full of cold water. When the alum is perfectly diſſolved, the ſilk is put to ſoak in it for near four hours: it may remain longer without any inconvenience, ſilk intended for crimſon requiring more alum than for any other colour. When taken out of the alum liquor, it is ſhook and dreſſed on the pegs, but without wringing. One of the dyers being queſtioned why the ſilk was not wrung when taken out of the liquor? anſwered, that it would purge it too much from an impregnation ſo abſolutely neceſſary for its taking the crimſon dye.

" Of the 72 pounds of ſilk already mentioned, 32 pounds is *organzine*, and the remaining woof. At Genoa it is the cuſtom to allow two ounces of cochineal to twelve of *organzine*, if deſigned for the warp of damaſk furniture, and for the ſame ſilk an ounce and three quarters of cochineal for 12 ounces of the woof, ſuppoſing it neceſſary to the beauty of the ſilk that the warp ſhould be fuller than the woof; and to bring the colour of the damaſk to ſtill more perfection, they add to the *organzine* a quarter of an ounce of cochineal, that is, inſtead of two ounces they add two ounces and a quarter, adding no more to the woof than one ounce and three quarters.

" As the above 32 pounds of *organzine* ſhould be of the fineſt colour, they allow two ounces and a quarter of cochineal to every pound of ſilk; ſo that upon the whole they uſe 142 ounces of cochineal, or 11 pounds 10 ounces, Genoa weight; namely, 32 pounds of *organzine* to two ounces and a quarter of cochineal, making 72 ounces; 40 pounds of woof to one ounce and three quarters, making 70 ounces. Total, 142 ounces.

" In order to dye this 72 pounds of ſilk, alumed as above, they make uſe of an oval copper containing when full 200 quarts of water; they fill this copper two-thirds full of clean fountain water, adding afterwards the following drugs pounded and ſifted. Two ounces of tartar, two ounces of *ſaffranum*, and two pounds and a half of the Levant galls.

" They wait till the drugs have boiled two minutes in this liquor; after which they add the 11 pounds 10 ounces of cochineal finely powdered and ſifted; and whilſt one of the workmen by degrees makes it ſink to the bottom, another keeps violently ſtirring the liquor with a ſtick to promote the ſolution.

" This done, they fill the veſſel with clean water to about a foot of the edge, immediately afterwards dipping the 32 pounds of *organzine*, divided on 14 rods. They let it remain till the veſſel which they fill with clean water, and under which they put a large fire, is ready to boil; they then, to make the ſilk take the colour more evenly, raiſe the rods without ceaſing, one after another, that each may alternately reach the bottom of the copper, which being but two-thirds full, the upper part of the ſilk would elſe remain out of the liquor, the rods being ſupported on the edge of the copper.

" When the liquor was ready to boil, the forty pounds of woof, divided on 18 rods, were dipped; they ſtill continuing to raiſe the rods, one after another, for half an hour, both the organzine and the woof, that each may alternately reach the bottom; ſo that when the workman came to the laſt he returned to the firſt, and ſo on ſucceſſively.

" After the firſt half hour, they ſtopped for a quarter of an hour between every operation, the workmen ſtill raiſing the rods from the firſt to the laſt, five or ſix times repeated in the ſpace of an hour and an half; all the time keeping a good fire under the copper. The *organzine* was then ſteeped in this liquor two hours and a quarter, and the woof only two hours. The fire was then taken from under the copper; and the workman taking out one dip of the *organzine* and another of the woof, he wrung and dried them as much as he could to ſee if the colour was what he wiſhed; if not ſufficiently deep for the purpoſe, he let them both remain in the liquor ſomething leſs than half an hour whilſt the liquor was growing cold. He then took out all the ſilk, wrung it on the peg, then waſhed it ſeveral times in clean water, changing the water every time. This done he wrung it again on the pegs, and ſo finiſhed the operation.

" It muſt be obſerved with regard to the *organzine* and woof, that though dyed in the ſame liquor, they were not however of the ſame ſhade at the concluſion of the operation; the organzine was deeper, having been a quarter of an hour longer in the cochineal liquor, during which time it was impregnated with the more ſubtle colouring particles of the cochineal.

" At Genoa it is not the cuſtom to waſh the ſilk out of the cochineal with ſoap water; on the contrary, they are perſuaded that this practice dulls the brightneſs of the colour, and that the water, both for the cochineal liquor and for waſhing afterwards, ſhould be the fineſt ſpring-water: for they remark, that the crimſon dyed in ſummer with ciſtern water, is by no means ſo bright as the crimſons dyed at other ſeaſons when the fountains are full.

" According to the dyers of Genoa, there is a kind of cochineal which though apparently beautiful, is not ſo in effect; that in uſing this cochineal it is neceſſary to alum the ſilk as much as poſſible, and to add to it more tartar than before mentioned. It is, however, impoſſible to give any certain rules concerning this matter; the dyer himſelf will judge of the quality of the cochineal fit for uſe. He ſhould however uſe the beſt; for were it even a fact that the inferior kind, with the aſſiſtance of a greater quantity of alum and tartar, gives a colour equal to the beſt, the ſilk thus weakened by alum would neceſſarily be always leſs perfect. The Genoeſe manufacturers are ſo well convinced of this, that they themſelves furniſh their dyers with cochineal in proportion to the ſilk given to be dyed."

65 Analyſis of the ſediment remaining after dyeing ſcarlet or crimſon.

After the operations of dying ſcarlet and crimſon already mentioned, there always remains a brown ſediment in the bottom of the liquor, which is thrown out as uſeleſs. This, on being examined by M. Hellot, was found to be a precipitated calx of tin, as he has aſcertained by reviving the metal from it, though not without great trouble, ſo that there can be no advantage in repeating his experiments. The remainder of this ſediment was compoſed of the dregs of the cream of tartar united with the groſs animal particles of the cochineal. Theſe laſt being waſhed over with water, and thus ſeparated from the earthy and metallic parts, were dried ſeparately, and afterwards bruiſed with an equal weight of cryſtals of tartar; after which they were ground to an impalpable powder, and boiled with a little alum. Thus they communicated a fine crimſon colour to a pattern of white cloth; from which our author is of opinion, that the cuſtom of reducing cochineal to powder and only ſifting it, does not give an opportunity of ſufficiently extracting the colour from this valuable material; he therefore gives the following receipt for doing ſo in a more perfect manner. "To an ounce of cochineal powdered and ſifted as uſual, he adds a fourth part of its weight of very white, clean, and dry cream of tartar. Theſe being ground together on a marble ſtone to an impalpable powder, are uſed both in the preparation and in the dye, omitting the ſmall quantity of cryſtals of tartar formerly directed for the preparation." The quantity here directed to be put to the cochineal, he thinks, evidently renders the colour more fixed.

66 How to extract all the colour from cochineal.

For madder red the preparation is pretty much the ſame as for kermes, and is always made with alum and tartar. Dyers are not agreed with regard to the proportions. M. Hellot puts five ounces of alum and one of red tartar to every pound of worſted; adding likewiſe about a twelfth part of ſour water, and boiling the wool in this ſolution for two hours. Worſted is to be kept for ſeven or eight days moiſt with this ſolution; but cloth is finiſhed in four days. A freſh liquor is prepared for dyeing this wool; and when the water is ſufficiently hot to bear the hand in it, you muſt throw in, for every pound of wool, half a pound of the fineſt madder, carefully ſtirring and mixing it well in the copper before you put in the wool, which is to be kept in for an hour; but without letting it boil, as that would tarniſh the colour. Nevertheleſs, for the dyer's ſecurity, it may boil for three or four minutes at the end of the operation; but the more that madder is boiled, the worſe is the colour it yields.

67 Of dyeing yellow.

The third primitive colour ſpoken of among dyers is that of yellow: and for this M. Hellot obſerves, that there are ten different ingredients fit for the purpoſe, though only five of them yield a good and permanent dye. Theſe are weld, ſavory, green-wood, yellow-wood, and fenugreek.

" Weld or wold generally yields the trueſt yellow, and is therefore preferred to all the others. Savory and green-wood, being naturally greeniſh, are the beſt for the preparation of wool to be dyed green; the two others yield different ſhades of yellow.

" The ſhades of yellow, beſt known in the art of dyeing, are ſtraw colour, pale yellow, lemon colour, and full yellow. The common orange colours are not ſimple, and therefore we ſhall not ſpeak of them at preſent.

Wor wool ſtuff

" For dyeing worſted and ſtuffs yellow, you make uſe of the uſual preparation, viz. of tartar and alum. You allow four ounces of alum to every pound of wool, or 25 pounds to every 100. With regard to the tartar, one ounce to every pound is ſufficient for yellow, though it requires two for red. The method of boiling is ſimilar to the preceding. For the welding, that is to ſay for yellowing, when the wood or ſtuff has boiled, you make a freſh liquor, allowing five or ſix pounds of weld to every pound of ſtuff; ſome incloſe the weld in a clean woollen bag to prevent it from mixing in the ſtuff; and to keep the bag down in the copper they put on it a croſs of heavy wood. Others boil it in the liquor till it has communicated all its colour, and till it falls to the bottom; the ſtuff is then ſuſpended in the net, which falls into the liquor; but others, when it has boiled, take out the weld with a rake, and throw it away. They ſometimes mix yellow wood with this weld; and ſome dyers mix any of the other ingredients before ſpecified, according to the ſhade required. By varying the proportions of the ſalts for the preparation, the quantity of the colouring ingredients, and the time of boiling, it is poſſible to produce an infinite variety of ſhades.

" For regular ſhades of light yellows you proceed as for all other regular ſhades, only that light yellows require a weaker preparation. For example, 12 pounds and a half of alum to 100 pounds of wool is ſufficient. The tartar ſhould alſo be diminiſhed, becauſe the wool is always waſted a little by the preparation, and that when you require only light ſhades they may be as eaſily obtained by a weaker preparation; thus you ſave alſo in the expence of the ſalts. But theſe light ſhades do not ſo well ſtand the teſt as the darker ſhades, which are dyed with the full proportion of tartar. Some dyers ſuppoſe that by letting their wool and ſtuff remain longer in the dye, they remedy this evil; becauſe they imbibe the colour more ſlowly in proportion to the weakneſs of the decoction: if you put wool into the dye, differently prepared, it will in the ſame time imbibe different ſhades. Theſe weaker preparations are called *half preparations* or *quarter preparations*, and require great attention, eſpecially for light ſhades of wool when dyed in the fleece for the manufactory of cloth and mixt ſtuffs, becauſe the wool is harder and more difficult to ſpin in proportion to the quantity of alum in the preparation; the ſtuff is conſequently leſs fine. This obſervation is not, however, of much importance with regard to worſteds for tapeſtry, neither with reſpect to ſtuffs; but it is not much amiſs were it only to ſhow that the quantities of the ingredients uſed in the preparation are not ſo very exact; but that they may be varied without any riſk, whether to give to the ſame ſhades to wool prepared in different preparations, or whether to make but one preparation, if more convenient for different ſhades.

" In order to dye with yellow wood, it ſhould be ſplit, or rather ſhaved with a joiner's plane: by this means it is more divided, conſequently yields better, ſo that a ſmaller quantity will do. Prepare it as you will, it ſhould always be tied up in a bag, to prevent it from mixing with the wool, and from tearing the ſtuff. The ſavory and green-wood, when uſed inſtead of weld, in order to vary the ſhade, ſhould be incloſed in the ſame manner.

"To the above mentioned ingredients for dyeing yellow we may here add the root of dock, the bark of aſh, eſpecially the ſecond bark; the leaves of the almond tree, peach, and pear tree; in ſhort, all aſtringent leaves, barks, and woods. Theſe will produce good yellows, more or leſs fine according to the time they have boiled, and in proportion as the alum or tartar predominates in the preparation. A larger quantity of alum makes it almoſt as fine as the yellow of weld; if the tartar prevails, the yellow has more of the orange; but if theſe roots, barks, or leaves, boil too much, the yellow terminates in ſhades of fawn colour.

"Though ſeveral dyers are accuſtomed for the good dye to uſe turmeric, a root imported from the Eaſt Indies, and which produces an orange yellow, it is however blameable; becauſe the colour very ſoon fades, at leaſt if not fixed with marine ſalt, as practiſed by ſome dyers who carefully conceal this art. Thoſe who uſe it for common ſcarlet, in order to ſave cochineal, and to give a lively orange red, are alſo reprehenſible; for ſcarlets dyed in this manner very ſoon loſe their bright orange caſt, which darkens by the air. We are, however, obliged in ſome degree to tolerate the deception; for this flaming colour being ſo much in vogue, it were impoſſible to produce it otherwiſe but by increaſing the quantity of compoſition, the ſuperabundant acid of which conſiderably injures the cloth."

ſilk
llow

For dyeing ſilk of this colour it ſhould have about 20 pounds of ſoap for every 100 of ſtuff; and after boiling with this ingredient, it ſhould be waſhed, alumed, and waſhed again (which is called *refreſhing*), when it is to be put upon the rods in hanks of about ſeven or eight ounces, and then dipped and returned in the yellow liquor. The fineſt yellow for ſilk is weld; and the proceſs, as delivered by M. Macquer, is as follows:

"A copper is prepared with about two pounds of weld to every pound of ſilk; and that all the weld may be well ſoaked, it is loaded with a large piece of wood. When it has boiled a good quarter of an hour, the bunches are puſhed to the far end of the copper, or rather, if you pleaſe, taken out; and by means of a bucket or ladle all the liquor may be taken out of the copper, and ſtrained into a copper or wooden trough; that is, by putting a ſieve or linen cloth acroſs a trough; by which means the liquor is cleanſed from all the grain and little ſtraws left by the weld in boiling. The liquor thus ſtrained is left to cool till you can bear your hand in it: the ſilk is then dipped and returned till the colour becomes uniform. If this boiling does not make ſufficient to fill the trough, it muſt be ſupplied with water, which ſhould be added before the liquor is cold, that the degree of heat already mentioned may be preſerved. In general, all dying veſſels ſhould be full, that the ſilk when dipped may be only two inches from the edge.

"During this operation the weld is a ſecond time boiled in freſh water; and when it has boiled, the ſilk ſhould be raiſed at one end of the trough, either upon a kind of barrow, or upon the edge of the trough. Half the liquor is then thrown away and repleniſhed by adding of the ſecond boiling as much as was taken from the firſt, obſerving to rake and mix the liquor well: ſuch is generally the method when any new addition is made; at leaſt if the contrary is not particularly ſpecified. This new liquor may be uſed rather hotter than the firſt; it ſhould nevertheleſs be always of a moderate heat, becauſe otherwiſe it would deſtroy a part of the colour which the ſilk had already taken, probably owing to the ſilk being deprived of part of the alum by the heat of the liquor. The ſilk is returned in this freſh liquor as at firſt; mean while you prepare a ſolution of pearl-aſh in proportion of about one pound to every twenty pounds of ſilk.

"For this purpoſe the pearl-aſh is put into a copper, and the ſecond liquor, quite boiling, poured on it, ſtirring in order to aſſiſt the diſſolving of the ſalt. This ſmall liquor is left to ſubſide, and the ſilk is a ſecond time raiſed on the barrow or trough, throwing into the liquor about two or three ladles of the cleareſt of the ſolution. The liquor is then well raked, the ſilk replunged, and again returned. This alkali developes and brightens the yellow of the weld. After ſeven or eight returns, one hank is wrung to try if the colour be full enough and ſufficiently bright; if deficient, a little more of the ſolution of the aſhes muſt be added, and the remainder of the ſilk done in the ſame manner till it has taken the ſhade required. The lixivium, ſeparately prepared, may be added, if you will, at the ſame time with the ſecond boiling of the weld-liquor; care ſhould be taken however that the liquor be not too hot. This operation is only for yellows, nor would the liquor do for greens.

"For yellow ſtill fuller, approaching to jonquil, when the pearl-aſh is added, it may be alſo neceſſary to add ſome rocou, in proportion to the ſhade required.

"For the light ſhades, ſuch as pale lemon or Canary-bird, they ſhould be boiled in the ſame manner as for blues, theſe ſhades being much more beautiful and tranſparent when dipped in a clear ground. To do this, when the weld is ready to boil, ſome of the liquor ſhould be taken out and mixed with a little clean water and a little of the liquor of the vat if boiled without azure. The ſilk is then dipped as uſual; and if deficient in ſhade, the weld liquor muſt be re-added, and the dipping repeated, if neceſſary, to complete the ſhade required.

"For deeper lemon colours the weld ſhould boil as for yellows, adding only a certain quantity with clean water, according to the fulneſs of the ſhade required: ſome of the liquor of the vat may alſo be added if neceſſary; but theſe dark lemon colours may be boiled in the common way as for yellows. It muſt be obſerved, however, that the blue of the vat is never added to theſe colours but when it is intended to give them a greeniſh caſt.

"Theſe very pale yellow ſhades are rather difficult, as they are very frequently liable to be affected by the air, and to deepen too much while drying. This happens when alumed in the common way, which is too much; but this inconvenience may be avoided, if inſtead of aluming as for other yellows, a ſeparate liquor is prepared, or even without any particular preparation, only a little alum put into the liquor of the weld.

"In manufactories where they cannot eaſily procure weld, they make uſe of the grains of Avignon, and preciſely in the ſame manner; but it gives a leſs permanent colour."

70 To dye cotton yellow.

Cotton to be dyed of a yellow colour ſhould be firſt well cleanſed in a lixivium of freſh wood aſhes, and afterwards well waſhed and dried. Another liquor is then prepared by diſſolving in the water, when ready to boil, about a quarter the weight of the ſubſtance to be dyed of Roman alum. The ſkeins are plunged into this alum liquor, returning them on the rods for ſome minutes. When equally penetrated throughout, the threads by which the ſkeins are tied being paſſed on the rods, the hanks are laid on the trough containing the alum liquor. The copper or trough is then covered, it being ſufficient to keep the liquor hot without boiling. The cotton, having been thus infuſed for 24 hours, is then dried, but without waſhing. We muſt obſerve, that the longer it remains dry, the better it takes the colour, and that the waſhing may be even diſpenſed with previous to the yellow dye.

A ſtrong weld liquor is afterwards prepared, adding for every pound of the ſubſtance to be dyed a pound and a quarter of weld. The cotton or thread, having been previouſly alumed, is then immerſed; the boiling checked with cold water, and the ſubſtance worked till it has taken the ſhade required.

The whole when dyed is plunged into a very hot liquor, but not boiling, made of blue vitriol, a quarter of a pound for every pound of the ſubſtance. When it has remained for about an hour and an half, the whole, without waſhing, is thrown into another liquor compoſed of about a quarter of a pound of white ſoap for every pound of the ſubſtance Having been well worked and the threads opened, it ſhould boil for three hours or more if you think proper. The ſoap might be diminiſhed to half the quantity, but the full proportion does better. This operation finiſhed, the whole is well waſhed and dried.

If you deſire a dark or jonquil yellow, neither the linen nor cotton ſhould be alumed; but for every pound of thread ſhould be added two pounds and a half of weld. When it has been dipped and well worked in this liquor till it has taken the colour equally, it is raiſed above the liquor, and half a pint of the kelp lixivium poured into it, made as directed in the article upon *red*. The thread is then returned upon the rods, dipped in this liquor; where having remained for a full quarter of an hour, it is taken out, wrung, and dried.

The lemon yellow is done after the ſame manner, only that for every pound of thread you put but one pound of weld, diminiſhing the verdigris in proportion, or even omitting it entirely by ſubſtituting in its place the alum liquor. By this means the yellow ſhade may be varied *ad infinitum*, and without any difficulty; in brightening and fixing the colour, however, the above method muſt be always obſerved.

Cotton-velvet is dyed with the root of a plant called *cureum* or *terra merita*, a ſpecies of ruſh which comes from the Eaſt Indies. It gives a beautiful yellow colour; but if dyed in the common manner, has but little ſolidity. This colour, according to M. de Apligny, may be fixed upon cotton or linen thread by dipping them in a ſolution of ſulphur of antimony in the kelp lixivium already mentioned. When treated in this manner, it is very beautiful as well as permanent.

71 Of faw root colour.

The fourth primitive colour ſo called among the dyers, is that which bears the appellation of *fawn* or *root* colour. It is however a kind of brown, and has the name of *root-colour* from being an ingredient in a great number of others. The proceſs for dyeing it is different from thoſe lately deſcribed; the wool requiring no other preparation than that of being ſoaked in water, as already directed for blue. The materials for dyeing it are the green ſhell of the walnut, the root of the walnut tree, the bark of the alder, ſantal, ſumach, roudoul or fovic, and ſoot.

The green ſhells of the walnut, collected when the nuts are perfectly ripe, and put into tubs or caſks, and afterwards filled with water, are in this manner preſerved till the year following. The ſhells are alſo uſed before the nuts are ripe; but theſe ſhould be ſaved apart, in order to be firſt uſed; becauſe, as the ſoft ſhell which adheres putrifies, it will keep but for two months only.

The ſantal or ſaunders is a hard wood imported from the Indies, generally ground into a very fine powder, and preſerved in bags; becauſe it is ſuppoſed to ferment, by which it is thought to be greatly improved; but our author has never obſerved any difference. This ground wood is generally uſed with one third of cariatour wood; by which, in the opinion of thoſe who prepare it for ſale, it is much improved. It is however nothing like ſo good as the walnut ſhells; becauſe, if uſed in too large a quantity, it ſtiffens conſiderably, and thereby injures the wool; hence it were beſt not to uſe it, either for wool or fine ſtuffs, except in the ſlighter ſhades, where it would not have ſo bad effect. It is generally mixed with galls, alder bark, and ſumach, as by this means only you can obtain its colour when not mixed with the cariatour. It yields but very little with the preparation of alum and tartar, eſpecially if it be not chipped; but notwithſtanding theſe defects, it is uſed on account of the ſolidity of its colour, which is naturally a yellow red brown. The air makes it deeper, and ſoap lighter. It loſes but little by a trial of alum, and ſtill leſs by tartar.

Of all the ingredients for dyeing fawn colours the walnut rind is the beſt. Its ſhades are finer, its colour ſolid; and by making the wool flexible, renders it leſs difficult to work. It is prepared in the following manner. You fill a cauldron half full of water, and when it grows warm, you add rinds in proportion to the quantity of ſtuffs to be dyed and to the colour required. It is then boiled; and when it is boiled for a quarter of an hour, the ſtuffs, having been previouſly moiſtened with warm water, are dipped; they are then turned and well ſtirred, till they have imbibed the colour deſired. If for worſteds, requiring an exact aſſortment of ſhades, you put leſs walnut rinds, and begin with the lighteſt ſhades. You put more walnut rinds in proportion as the colour is exhauſted, and then dip the darkeſt ſhades. With regard to ſtuffs, you ge-

generally begin with the deepeſt, and as the colour of the dye diminiſhes, you dip the lighteſt. They are aired as uſual, dried, and dreſſed.

The root of the walnut tree is, next to the huſk, the beſt dye for fawn colour: it alſo gives a very great number of ſhades, nearly reſembling thoſe of the huſks; hence they may be ſubſtituted for each other, but the root requires a different proceſs. You fill your cauldron three quarters full of river water, putting in the root, cut ſmall, in proportion to the quantity of wool to be dyed, and to the ſhade required. When it is very hot, you dip the wool or ſtuff, turning and returning it as before, remembering to air it from time to time; and, if ſtuff, to draw it through the hands in order to ſhake off the ſmall bits of the root, which might elſe ſpot the ſtuff. To avoid theſe ſpots, the root ſhould be tied in a bag. You afterwards dip the lighter ſtuffs, and ſo on, till the colour of the root is exhauſted. If worſted, you always begin with the lighteſt, as for other colours; but of all things you muſt be careful to keep your liquor from boiling at the beginning, as in that caſe the firſt piece of ſtuff would imbibe all the colour.

The method of dyeing with roots is not very eaſy; for if you are not very attentive to the degree of heat, to turning and returning the ſtuffs or worſteds, ſo as to dip them equally, you run a riſk of their being either too dark or ſpotted, for which there is no remedy. In this caſe, the only reſource is to dye them marone, prune, or coffee colour. In order to avoid this evil, you muſt keep the ſtuffs continually turning on the reel, and dip them only piece by piece, nor let the liquor boil till the root has yielded all its colour. The worſteds or ſtuffs dyed in this manner, ſhould be aired, well waſhed, and dried.

Nothing more can be ſaid concerning the bark of alder, than what has been already obſerved with reſpect to the root of the walnut tree, only that letting it boil at the beginning is not of ſo much conſequence, becauſe it yields its colour leſs freely. It is generally uſed for worſteds and colours darkened with copperas. It nevertheleſs produces a good effect on wool not intended for colours extremely dark, and perfectly withſtands the power of the air and ſun.

Sumach is nearly of the ſame nature, and uſed in the ſame manner as the huſks: its colour is not ſo deep, and is rather greeniſh. It is for dark colours frequently ſubſtituted for nut galls; but a greater quantity is requiſite. Its colour is alſo perfectly ſolid and permanent. Theſe different ſubſtances are ſometimes mixed together; and as they are equally good, and produce nearly the ſame effect, there is no great difficulty in obtaining certain ſhades. We muſt, nevertheleſs, be directed by cuſtom in the production of theſe fawn colour ſhades, which abſolutely depend upon the eye, and which are not difficult to manage.

With regard to the mixing of theſe ingredients with ground ſantal, you put four pounds of the latter into the copper, half a pound of nut galls pounded, twelve pounds of alder bark, and ten pounds of ſumach (theſe quantities will dye 25 or 27 ells of cloth). The whole is boiled; and having checked the boiling with a little cold water, you immerſe the cloth, turning and reſtirring it for two hours: it is then taken out, aired, and waſhed in the river. You afterwards dip ſome more ſtuff in the ſame decoction, if you want a lighter ſhade; and in this manner you may contrive as long as the liquor retains any colour. The quantities of theſe ingredients are augmented or diminiſhed in proportion to the depth of the ſhade required, letting the wool or ſtuff boil accordingly.

73 Of dyeing with ſoot.

Here we ſhall deſcribe alſo the manner of dyeing with ſoot, though it has leſs ſolidity than the others, and has alſo the property of hardening the wool, and giving the ſtuff a very diſagreeable ſmell.

The ſoot and water is generally put into the copper at the ſame time, and the whole well boiled. The ſtuff is then immerſed, and more or leſs boiled according to the ſhade required; it is afterwards taken out and cooled, and thoſe intended for the lighteſt ſhade are then put in; they are afterwards well waſhed and dried. But the beſt method is to boil the ſoot in the water for two hours, to let it ſtand afterwards, and then to empty the liquor into another copper, without mixing the ſoot. The wool and ſtuffs are then dipped in the liquor, and are thereby leſs hardened than if they had been mixed with the ſoot: but this does not render the colour more permanent; and indeed it were better never to make uſe of this ingredient, except for ſtuffs of little value, eſpecially as it can be ſupplied by other ingredients already mentioned, and which give a better and more laſting colour, and are beſides more ſoftening to the wool. In the dye they frequently employ the green walnut ſhell, and the root of the walnut tree for their fawn colours. Theſe two ſubſtances are uſeful both for the greater and leſſer dye: there are, however, places where it is difficult to meet with them, and where they are therefore obliged to make uſe of ſaunders and even of ſoot.

74 Of dyeing black.

The laſt of the primitive colours ſo called by the dyers, is black; which includes a vaſt number of ſhades, from the lighteſt grey or pearl-colour to the deepeſt black. Hence it is ranked among the primitive colours in dyeing; for among dyers the word *primitive* does not denote *ſimplicity*, but only being the original colour from whence a number of others are derived. In order to dye woollen ſtuffs of a good black, they ſhould firſt be dyed of a mazareen blue as deep as poſſible; which is called the *baſis* or *ground*, and is to be performed in the manner already directed. The ſtuff ought to be waſhed well in running water as ſoon as it comes out of the vat; and afterwards ſcoured at the fulling mill; which operation is of the utmoſt conſequence, becauſe without it the ſubſequent colour will be greatly injured by the lime in the liquor for dyeing blue. This being done, the colour is finiſhed in the following manner. For 100 pounds of cloth put into a cauldron of a moderate ſize, ten pounds of logwood, cut into chips, and ten pounds of Aleppo galls pulveriſed, the whole encloſed in a bag: theſe ingredients are boiled in a ſufficient quantity of water for 12 hours. A third part of this liquor is emptied into another cauldron, with two pounds of verdigris; the ſtuff is then entered and turned for two hours without ceaſing. It is neceſſary to obſerve that this liquor ſhould boil very ſlowly, or it is ſtill better to keep it very hot without boiling. The ſtuff is then taken out, and the ſecond third of the liquor thrown into the copper to the firſt third, with the addition of eight pounds of copperas. The fire under the cauldron is diminiſhed, and the copperas left to diſſolve for half an hour, letting the liquor cool, after which the ſtuff is kept turning an hour; it is then taken out and cooled. The reſt of the liquor is then mixed with the two firſt thirds, carefully ſqueezing the bag well. To this is added 15 or 20 pounds of ſumach: you give it another boil, and then cool it with a little water; having previouſly added two pounds more of copperas, you again turn the ſtuff for two hours; it is then taken out, cooled, and again put into the cauldron, turning it conſtantly for an hour longer. After this it is carried to the river, well waſhed and ſcoured at the fulling mill. When it is thoroughly ſcoured, and the water comes out of it clear, you prepare a freſh liquor with as much weld as you think proper; you give it one boil, cool it, and dip the ſtuff. This laſt decoction ſoftens and confirms it a very fine black. For the moſt part, however, they do not take ſo much pains; but are ſatisfied, when the cloth is blue, to dip it in a decoction of nutgalls, and to let it boil for two hours. It is afterwards waſhed, and ſome copperas and logwood added to the liquor; after which the ſtuff is again dipped for two hours, and then waſhed and ſcoured.

It may be alſo dyed in the following manner: for 15 ells of cloth, previouſly dyed blue, M. Hellot had a pound and a half of yellow wood, five pounds of logwood, and 10 pounds of ſumach, put into a cauldron. In this the cloth boiled for three hours; after which it was taken out, and 10 pounds of copperas thrown into the copper. When the copperas was diſſolved and the liquor cooled, the cloth was put into it for two hours; it was then taken out and cooled, after which it was again immerſed for an hour, and then waſhed and ſcoured: it was tolerably fine, but not ſo velvety as the preceding.

75 Experiments to determine whether maddering be an advantage in that colour.

It was commanded by the ancient French regulations, that ſtuffs ſhould be maddered after they had been blued, and before they were dyed black. Deſirous of aſcertaining the advantage reſulting from this proceſs, our author took a bit of cloth which had been dyed blue; this being divided, one half was boiled with alum and tartar, and afterwards maddered. It was then blackened in the ſame liquor with the other half which had not been maddered, conformable to the firſt of the two methods juſt deſcribed. They were each of them a very beautiful black; it nevertheleſs appeared that the maddered ſtuff had a reddiſh caſt: the other black was certainly more beautiful, more velvety, and much finer. There is, indeed, leſs danger of the maddered ſtuffs ſoiling the hands and linen, becauſe the alum and tartar of the preparation had carried off all the looſe particles. This advantage is not however ſufficient to make amends for the inconvenience of maddering, as the ſtuff is always in ſome degree injured by the alum and tartar, and as the madder gives it a reddiſh caſt diſagreeable to the eye, and beſides this operation raiſes the price of the dye to no purpoſe.

Some dyers, to avoid theſe inconveniences in part, madder their cloth without having previouſly boiled it in alum and tartar. But madder uſed in this manner has no permanency.

Black is ſometimes dyed without having given it the blue ground; and this method of dyeing is uſed for light or thin ſtuffs of inferior value, conſequently not conſiderable enough to bear the expence of a deep blue previous to their being dyed black. It is however proper at the ſame time to give theſe ſtuffs a ground of the green walnut ſhell, or of the root of the walnut-tree, to avoid the neceſſity of blackening them with too great a quantity of copperas.

This proceſs is attended with no manner of difficulty. The cloth is prepared with the green walnut ſhell, and afterwards blackened in the manner already deſcribed, or as near it as poſſible. For with black, as with ſcarlet, moſt dyers ſuppoſe that they are poſſeſſed of a ſecret for dyeing a much finer black than any of their fraternity; this, however, conſiſts in augmenting or diminiſhing the quantities of the ſame ingredients, or in ſubſtituting others which produce the ſame effect. M. Hellot has tried ſeveral methods; but ſuppoſes that what is ſtrictly meant by ſucceeding to perfection, depends rather on the manner of working, handling, and airing the ſtuff properly, than upon the exact quantity of the ingredients.

Why nece previ to dy ſtuffs

It may not in this place be improper to explain the reaſon of the neceſſity of giving ſtuffs a blue, or at leaſt a root colour ground, previous to their being dyed black; and why the dyeing white black is expreſsly prohibited in France; becauſe in that caſe it is neceſſary to uſe a much greater quantity of nutgalls: this would indeed be no great evil, as nutgalls of themſelves do not injure the wool; but in order to overcome this gall, according to the workmens phraſe, that is, to blacken it, or properly ſpeaking rather to form an ink on the ſtuff, it requires a greater quantity of copperas, which not only hardens the ſtuff, but, from the acidity impreſſed on the fibres of the wool by this ſalt, makes it brittle: on the contrary, when the ſtuff has had a ground, that is to ſay, a ſtrong layer of ſome deep colour, there is much leſs occaſion for either.

Blue is preferable to any other colour; firſt, becauſe it is the neareſt to black, which is in fact only a deep blue; and, ſecondly, as there is no occaſion for any other preparation than previouſly boiling the wool, the ſtuff is in no reſpect injured. For the ſame reaſon, viz. the preſervation of the wool, the root colour is ſubſtituted for inferior ſtuffs inſtead of the blue, which would enhance the price; it is therefore neceſſary that this root-colour ground ſhould be as deep as poſſible; becauſe the darker it is, there is occaſion for leſs copperas to complete the black.

It alſo frequently happens, that when ſtuffs of any colour are badly dyed or ſpotted, they are dipped in black: it is however adviſable to dip them firſt in blue, unleſs the colour be very dark, in which caſe they would take a very fine black; but this is the laſt reſource. Theſe ſtuffs are not commonly dyed black, if it be poſſible to make them any other colour; becauſe, having been prepared with alum and tartar for the firſt colour, the copperas requiſite for the black would conſiderably injure and greatly diminiſh their quality.

How dye colo

The ſhades of black are greys, from the darkeſt to the lighteſt. They are of great uſe in the art of dyeing, as well for their own colours ſimply as when applied

plied to other colours, which is called *darkening*. At preſent we ſhall mention two methods of producing them. The firſt and moſt general is to boil ſome pounded nutgalls with a proper quantity of water for two hours; at the ſame time diſſolving ſome copperas in a little water ſeparately. Having prepared a cauldron of liquor ſufficient for the quantity of wool or ſtuff to be dyed, you add to it, whilſt the water is too hot for your hand, a little of the decoction of the nutgalls with the ſolution of copperas. The ſtuff intended for the lighteſt grey is then dipped. When ſufficiently coloured according to your deſire, you add ſome freſh decoction of nutgalls with ſome of the infuſion of the copperas, and then dip the next ſhade. In this manner you proceed to the darkeſt ſhade, conſtantly adding theſe liquors, from the tawny grey even to black; but it is much better to give the tawny grey and the extreme dark ſhades a blue ground, more or leſs as you like, for the reaſon above mentioned.

The ſecond method of producing grey ſeems to be preferable; becauſe the juice of the galls is better incorporated with the wool, and you are thereby ſure of uſing no more copperas than is abſolutely neceſſary. It even appears that the greys are more beautiful and the wool brighter. It alſo appears to be equally ſolid; for they are both of them equally proof againſt the air and ſun. The ſecond method is much leſs prejudicial to the quality of the wool, and is attended with no more difficulty than the firſt.

You boil a ſufficient quantity of nutgalls, well pounded and incloſed in a clean linen bag; you afterwards put the wool or ſtuff into this liquor, letting it boil for an hour, moving and ſtirring it about, after which it is taken out. You then add to the ſame liquor a little copperas diſſolved in a part of the ſolution, and then dip the woollens intended for the lighteſt ſhade. You again add a little of the copperas ſolution, continuing in this manner as in the firſt operation till you come to the darkeſt ſhades. In either proceſs, if not reſtrained by patterns, you may catch the preciſe ſhades, beginning with the dark and finiſhing with the light, in proportion as the liquor becomes exhauſted of its ingredients; keeping the pieces of ſtuff or wool immerſed for a longer or ſhorter time, till the ſtuff takes the colour deſired.

It is as impoſſible to determine the quantity of water neceſſary for theſe operations, as it is to ſpecify the quantity of the ingredients, or the time for letting the wool remain in the liquor. The eye muſt judge of theſe things. If the liquor be ſtrongly impregnated with colour, the wool will imbibe the ſhade in a ſhort time; but, on the contrary, it muſt remain longer if the liquor be exhauſted. When the wool is not dark enough, it is dipped a ſecond time, a third, or even more, till it is of a ſufficient colour; the only neceſſary attention is to prevent the water from boiling. If it be by chance too deep, the only remedy is to dip the ſtuff in a freſh warm liquor, adding to it a little of the decoction of nutgalls. This liquor carries off a part of the precipitated iron of the copperas; conſequently the wool or ſtuff becomes lighter.

But the beſt way is to take it out of the liquor from time to time, not leaving it in long enough to imbibe more of the colour than required. It may alſo be dipped in a ſolution of ſoap or alum; but theſe correctives deſtroy a great part of the colour, ſo that it is often neceſſary to darken it again; by this means the wool, which ſuffers greatly by the reiterated action of theſe ingredients, is injured. All greys, however dyed, ſhould be well waſhed in a large ſtream, and the darkeſt even ſcoured with ſoap.

Theſe dingy ſhades, from the lighteſt to the darkeſt, are produced by the ſame operation from which common ink is obtained. The green vitriol contains iron; were it blue, it would contain copper. Pour a ſolution of this green copperas into a glaſs, holding it in the light and dropping into it ſome of the decoction of nutgalls. The firſt drops that fall into this limpid ſolution of ferruginous ſalt produces a reddiſh colour, the next turns it bluiſh, then a duſky violet colour, and at laſt it becomes a dark blue, almoſt black, which is called ink. To this ink add a quantity of pure water; let the veſſel reſt for ſeveral days, and the liquor by degrees becomes clearer and clearer, till it is almoſt as limpid as common water, and at the bottom of the veſſel you will perceive a black powder. Having dried this powder, put it into a crucible; calcine this, and put to it a little ſuet or any other fat, you will obtain a black powder which may be attracted by the loadſtone. This, therefore, is iron; this is the metal which blackens the ink; and this, when precipitated by the nutgalls, lodges in the pores of the fibres of the wool, dilated by the heat of the liquor, and contracted when the ſtuff is expoſed to the air. Beſides the ſtyptic quality of the nutgalls, by which they have eminently the property of precipitating the iron of the copperas and producing ink, they alſo contain a portion of gum, as may be aſcertained by evaporating the filtered decoction. This gum being introduced into the pores with the ferruginous atoms ſerves to retain them; but this gum being eaſily ſoluble, it has not the tenacity procured from a ſalt more difficult of ſolution; therefore theſe dark colours have not the ſolidity of other ſolid colours prepared in a boiling ſolution of alum and tartar, and therefore plain greys have not been ſubmitted to the uſual trial.

78
How to dye ſilk of a black colour.

It is by no means eaſy to produce a good black colour on ſilk, though the baſis is undoubtedly the ſame, viz. iron diſſolved by acids, and precipitated on the cloth by a vegetable aſtringent. The following proceſs is given by M. Macquer. "Twenty quarts of vinegar are put into a trough with one pound of black nutgalls pounded and ſifted, and five pounds of freſh iron-filings. While the infuſion is making, you clean out the copper in which you put the black ground, with the following drugs pounded, viz.

8 lb. of black nutgalls
8 — of cummin
4 — of ſumach
12 — of pomegranate rind
4 — of bitter apple

3 lb. of agaric
2 — of *coque de Levant*
10 — of buckthorn
6 — of linſeed.

"Theſe ſeveral drugs are put into a copper, containing half the quantity of the veſſel uſed for the black ground, and filled with water. Twenty pounds of Campeachy or logwood chips are afterwards incloſed in a linen bag, for the conveniency of taking them out of the liquor, unleſs you chooſe to take them out with a pierced ladle, or any other means, becauſe theſe muſt boil a ſecond time as well as the other drugs.

"When the logwood has boiled for about a quarter of an hour, it is then taken out and properly preſerved. The above-mentioned drugs are then put into the logwood decoction, and alſo boiled for about a quarter of an hour, carefully checking with cold water as often as it ſeems ready to boil over.

"This operation being finiſhed, the liquor is ſtrained through a linen ſtrainer into a trough, and then left to ſettle, carefully preſerving the grounds which muſt be again boiled.

"The cold infuſion of the vinegar with the nutgalls and iron filings is then put into the copper intended for the black ground. The fire is afterwards put under it, and the following ingredients immediately added, viz.

20 lb. of gum arabic pounded
3 — of realgar or red arſenic
1 — of ſal ammoniac
1 — of ſal. gem.
1 — of mineral cryſtal
1 — of white arſenic pounded
1 — of corroſ. ſublimate

2 lb. of green copperas
2 — of the ſcum of ſugar candy
10 — of powder ſugar
4 — of litharge pounded
5 — of antimony
2 — of orpiment
2 — of plumbago.

Theſe ſeveral drugs ſhould be pounded and ſifted, except the gum arabic, which is only broken.

How to uſe the native gums in this operation.

"Inſtead of gum arabic the native gums may be uſed, and diſſolved in the following manner: Some of the logwood decoction is put into a boiler; when hot, you put into it a copper ſtrainer, made in the ſhape of an egg, and open at the largeſt end. The gum is put into this ſtrainer, and diſſolves as the liquor heats; it muſt be ſtirred with a wooden peſtle, that it may paſs through the holes. When it is entirely paſſed, you introduce another copper ſtrainer, with holes ſtill ſmaller than the former, to prevent the impurities of the gum from eſcaping. The liquor of the gum already diſſolved is poured into this ſtrainer, and again paſſed as before by the help of the peſtle. This operation is made more eaſy, by now and then taking out the ſtrainer and reſting it on a croſs ſhelf or plank, ſuſpended on the peg over the copper uſed for wringing the black. The gum muſt be ſqueezed pretty hard with the peſtle to force it through the holes of the ſtrainer.

"The gum would diſſolve with more facility if previouſly ſteeped for three or four days in the logwood decoction, eſpecially if you are careful to pour it on very hot.

"When the above ingredients are put into the black ground, you muſt remember to keep the liquor hot enough to diſſolve the gum and the ſalts, but it ſhould never be ſuffered to boil; and when it is therefore ſufficiently hot, the fire is taken away, and the freſh iron-filings ſprinkled over it in a proper quantity to cover the liquor.

"The next morning the fire is again put under the copper, the drugs boiled, and the logwood a ſecond time boiled. It is then taken out, and the following drugs added to this ſecond decoction, viz.

2 lb. of black nutgalls pounded
4 — of ſumach
4 — of cummin
5 — of buckthorn berries

6 lb. of pomegranate rinds pounded
1 — of bitter apple
2 — of agaric pounded
2 — of *coque de Levant*
5 — of linſeed

Theſe drugs are boiled, the liquor ſtrained and poured on the black ground as we have already ſaid, and the grounds preſerved. You then put a little fire under the copper as at firſt, and the following drugs are immediately added, viz.

8 oz. of litharge pounded
8 — of antimony pounded
8 — of *plumb de mer*, alſo pounded
8 — of white arſenic pounded
8 — of cryſtal mineral

8 oz. of rock ſalt
8 — of fenugreek
8 — of corroſive ſublimate
8 lb. of copperas
20 — of gum arabic, prepared as above

"When the liquor is hot enough, you take away the fire, ſtrewing over the liquor with the iron-filings, and letting it ſtand for three or four days.

"Two pounds of verdigris are then pounded and diſſolved with ſix quarts of vinegar in an earthen pot, adding to it about an ounce of cream of tartar. The whole ſhould boil for a full hour, taking care to check the boiling with cold vinegar that it may not boil over. This preparation ſhould be kept ready to be added to the black ground when you are going to dye.

"For the black dye the ſilk is boiled as uſual; having waſhed and beetled according to cuſtom, you give the gall liquor for heavy blacks twice, but for light blacks only once. Theſe two blacks are alike both in beauty and ſhade, differing only in the weight of the ſilk: the light black has, however, rather more luſtre.

"The nutgall liquor is made as follows: For every pound of ſilk you muſt have three-quarters of a pound of light nutgalls, adding the ſame quantity of Aleppo. Theſe galls are pounded together, and boiled for two hours in a quantity of water ſufficient for the whole of the ſilk to be galled. As the liquor waſtes a great deal in the boiling, it is, after the firſt hour, filled again, and after two hours the fire is taken away; the liquor is then left to depoſit, and the galls taken out with a pierced ladle; about an hour afterwards the ſilk is put into it, prepared as above.

During this operation the ſilk is drained and very lightly ſqueezed: it is then immerſed in the gall liquor, on cords one above another, taking care to keep it near the ſurface of the liquor, but ſufficiently covered. In this manner it ſhould remain 12 or 15 hours; it is then taken out, waſhed at the river, and if intended for heavy black, is a ſecond time galled in a freſh galling like the firſt; the grounds are generally uſed for the firſt galling; but for the ſecond a liquor of freſh drugs.

"Some dyers gall the heavy blacks but once, by boiling the old grounds, taking them out immediately, and afterwards adding freſh galls; for every pound of ſilk a pound of light gall and half a pound of fine Aleppo. The freſh galls they boil for two hours or more, and when the grounds are taken out they put the

the ſilk in the freſh gall liquor, where they let it remain a day and a night.

" This method, they ſay, is the beſt; becauſe, were the gall grounds to remain in the liquor, they would re-imbibe part of the ſubſtance which they had before given to the water.

" When the ſilk is galled, a little fire is put under the black ground; while it is heating, the ſilk is wrung out of the galling, and beetled at the river.

" When waſhed it is drained on the pegs, paſſing a thread round every hank, each hank as large as for common colours: it is then immediately put on the rods.

" While the black liquor is heating, it ſhould be ſtirred with an iron rake or paddle, to prevent the grounds from ſticking to the bottom of the copper. You then diſſolve ſome French gum by the method above deſcribed, till it riſes on the top in a kind of ſcum covering the ſurface of the liquor; afterwards you throw into it two or three handfuls of linſeed. You then add half of the vinegar and verdigris preparation with about four or five pounds of copperas; this ſhould be punctually repeated at every heating.

" Care ſhould be taken whilſt the fire is under the copper to rake; and, to try if it be hot enough, the rake is moved round at the bottom of the copper; if the gum ſticks to the rake, and the liquor does not appear through the middle of the gummy ſcum, it ſhows that it is hot enough: the fire is then taken away, becauſe, as we have before obſerved, it ſhould not boil. The rake is then alſo taken out, and the liquor covered with iron-filings in the ſame manner as before; after this it is ſuffered to ſubſide for about an hour, when the ſurface of the liquor is again ſtirred, in order to precipitate the filings to the bottom.

" Before we explain the manner of dipping ſilk in the black liquor, it is proper to obſerve that ſilk-dyers never dye black but by coppers, that is when they have a ſufficient quantity of ſilk for three dips, if for heavy black; but if light black only two dips, which is done in the following manner:

" If heavy black, a third of the ſilk is put upon the rods, and three times returned in the black ground; it is afterwards wrung on the peg over the copper; this is done by giving it three twiſts: in this manner three hanks may be wrung at once, becauſe it ſhould be done gently, and only to drain; it is again put on the rods, and ſuſpended between two perches to air.

" While the firſt ſilk is airing, the ſecond third part is dipped in the ſame manner, and afterwards the third third part, always in the ſame manner. It muſt be remembered, that while the ſilk is on the rods it ſhould be turned from time to time to give it air.

" When the laſt third part is wrung, the firſt part is put in, and then the two others ſucceſſively for three times, always airing at each time. This is commonly called giving the three wrings, and theſe three wrings are called one fire or heating.

" The light blacks ſhould alſo have three wrings to one fire.

" After each fire the black ground is again heated, adding copperas and gum as before. This operation is thrice done for the heavy blacks, that is three fires, each fire conſiſting of three wrings; but for light blacks only twice, each alſo conſiſting of three wrings.

" It muſt be obſerved, that at every reheating it is requiſite to change the order of dipping, in ſuch a manner that each may in its turn have the firſt of the liquor. If the black dye is ſtrong and good, the heavy blacks may be done with two fires only; and for the light blacks one wringing leſs may do for each heating.

" When blacks are finiſhed they are returned in a trough of cold water by dips one after another, called by the French dyers *diſbroder* or rinſing; they are then twice or thrice beetled at the river. When waſhed you put them on the cords, only taking care not to preſs them too much.

" The ſilk when taken out of the black dye is extremely harſh, which is by no means wonderful, conſidering the number of acids and corroſives in the compoſition. It is therefore neceſſary to ſoften it in the following manner:

80 To ſoften black ſilk.

" Diſſolve about five pounds of ſoap in two buckets of water; and while the ſoap is diſſolving, throw in a handful of aniſeed or any other aromatic plant. It ſhould boil till the ſoap is entirely diſſolved. In the mean time a trough ſhould be provided full of cold water, and large enough to dip all the ſilk at the ſame time. The ſoap-water ſhould be ſtrained through linen, the whole mixed well together, and the ſilk put in, where it ſhould remain a full quarter of an hour. It is then taken out, wrung on the peg, and dried as uſual. As the quantity of ſoap can do no harm, too much is better than too little. This ſoftening is very neceſſary, in order to diveſt the ſilk of that ruſtling and ſtiffneſs ſo prejudicial in the manufacture of black goods.

81 To dye black in the raw.

" To dye black in the raw, the ſilk ſhould be galled in a cold liquor of freſh galls, which had been previouſly uſed for the boiled ſilk. The natural yellow of the ſilk is preferable for this dye, becauſe the white takes a leſs beautiful caſt.

" Having untied the ſilk and divided it into hanks of the common ſize, it is dipped with the hands into the gall liquor. When ſoaked and a little ſqueezed, it is ſtrung on cords, eight or ten hanks together.

They are afterwards put into the cold gall-liquor, one above another, letting even the cords ſink in the liquor, where they may remain for ſix or ſeven days. They are then taken out and once beetled at the river. As to time, it ſhould remain in the galling according to the ſtrength of the liquor and the quantity of the ſilk put into it; but however ſtrong it may be, and however ſmall the quantity of ſilk, it ſhould remain two or three days at leaſt.

" When the ſilk is waſhed, it is again ſtrung on the cords and left to drain, after which the cords are put one over the other into the rinſing or black waſh, which is of itſelf ſufficient to dye; it will, however, require more or leſs time according to the ſtrength of the rinſing waſh, generally about three or four days. Whilſt the ſilk is thus immerſed in the rinſing water, it ſhould be raiſed with ſticks three or four times a-day; it is then drained over the liquor, and when drained put on the ground in a proper place, where it is ſpread and aired, but not dried. This is abſolutely neceſſary to produce the black, elſe the ſilk might take a black-grey; this grey would, however, blacken in the air: nevertheleſs you are thereby enabled to judge how much of the colour it has taken, and how much it may ſtill want. Should the ſilk be ſuffered to dry, it muſt be again wetted before it is re-dipped, which would be an additional and unneceſſary trouble.

"This operation of waſhing and drying muſt be ſucceſſively continued till the ſilk is ſufficiently black.

"The ſilk in this ſituation is carried to the river, and twice beetled; after which it is drained on the cords, and then put on the perches to dry without wringing, which would ſoften it too much: for as this kind of ſilk is deſigned for gauzes and black lace, care ſhould be taken to preſerve its natural ſtiffneſs as much as poſſible.

"To produce black in the raw in the quickeſt manner, the ſilk when waſhed from its galling ſhould be put on the rods and three times returned in the blacking ground; it is then taken out, and put to drain over the veſſel containing the black liquor, and then cooled on the rods.

"When drained, it is again twice dipped in the black liquor, drained, and each time cooled as at firſt. When drained, it is again waſhed; and the procedure is then the ſame as for thoſe which had been dyed in the rinſing. This is not, however, the uſual method of dyeing black in the raw; becauſe it conſumes the black liquor too ſoon, conſidering with what avidity the raw ſilk takes any colour whatever; and beſides that a good rinſing is ſufficiently ſtrong for dyeing this colour.

"The black dye is weakened and becomes exhauſted in proportion to the ſilk it has dyed; it is therefore neceſſary to ſtrengthen and repleniſh, from time to time, by an addition of proper drugs, which is called giving the *brevet* or *compoſition*.

"This compoſition is made by putting four or five buckets of water into a copper, and then boiling it with about four pounds of logwood chips. The logwood is then taken out, and four pounds of black buckthorn berries is added with two pounds of pomegranate rind, two pounds of ſumach, two pounds of *Coque de Levant*, two pounds of coliquinte, two pounds of linſeed, and four pounds of cummin.

"Theſe drugs are boiled together for about three quarters of an hour; the fire is then put under the black liquor, when a little more than half boiled, and whilſt hot the following drugs are added, viz.

2 lb. of realgar
4 — of antimony
1 — of gold litharge
1 — of ſilver litharge
1 — of ſal ammoniac
1 — of rock ſalt
1 — of cryſtal mineral

1 lb. of white arſenic
1 — of corroſive ſublimate
1 — of orpiment
1 — of powder ſugar
1 — of ſunegreek
4 — of copperas.

"Theſe drugs, when all pounded, are thrown into the black ground, remembering to ſtir. When the compoſition is ſufficiently boiled, it is ſtrained in a trough and left to ſettle; the grounds having ſubſided, the clear part is added to the black ground. The ſame grounds are again boiled and preſerved for ſome other time.

"The compoſition being added to the black liquor, and ſufficiently hot, the fire is taken away. The liquor is then ſtrewed over with the iron-filings, and left to ſettle for two days.

"When the black ground has had a certain number of additions, and a quantity of ſediment collected at the bottom, part of the grounds ſhould be taken out in order to clear the liquor. Thus frequently repleniſhing, the foundation is always preſerved; ſo that the liquor is never entirely new, but having been once ſet in a dye-houſe is ſet for ever. Theſe liquors are never liable to putrefaction, owing to the great quantity of nutgalls and martial vitriol in the compoſition, two of the moſt powerful antiſeptics known.

"The moſt material obſervation concerning the black dye is, that in general it greatly injures the goods in ſuch a manner that ſtuffs of this colour, though not inferior in other reſpects, wear out much ſooner than thoſe of any other. This defect may be attributed to the vitriolic acid of the copperas, which is but imperfectly ſaturated with the iron. Iron combined with any, even vegetable, acid, is capable of producing black with vegetable aſtringents. It is therefore moſt probable that this inconvenience might poſſibly be removed, by ſubſtituting other combinations of this metal for the copperas, if it were worth while to make the attempt."

82 Of d ſilks g

"All kinds of grey, excepting black grey, are produced upon ſilk without aluming. The ſilk being waſhed from the ſoap and drained on the peg, a liquor is made of fuſtic, logwood, archil, and copperas. Fuſtic gives the ground; archil the red; logwood darkens, and the copperas ſoftens all theſe colours, turns them grey, and at the ſame time ſerves inſtead of alum in extracting them. As there is an infinite variety of greys without any poſitive names, and produced by the ſame methods, it would be endleſs to enter into a detail that would prolong this treatiſe to ſo little purpoſe.

Suffice it to remark here, that in producing a reddiſh grey the archil ſhould predominate; for thoſe more grey, the logwood; and for thoſe ſtill more ruſty and rather greeniſh, fuſtic.

In general, when obliged to complete the colour with logwood, it ſhould be uſed rather ſparingly, becauſe it is apt in drying to darken too much, differing in this particular from all other colours.

To give an example of the manner of producing theſe colours we ſhall take the nut-grey.

The fuſtic decoction, archil, and a little logwood, is put into water moderately hot. The ſilk is then returned, and when the liquor is exhauſted it is taken out; and to ſoften the colour the copperas ſolution is added. Some dyers for this purpoſe add the black waſh inſtead of the copperas; the ſilk is again returned; and if the colour does not appear ſufficiently even, ſome red ſpots ſtill remaining, it may be concluded that it requires a little more copperas.

It muſt alſo be remembered, that as copperas is the general baſe of all greys, if deficient in quantity, the colour will be apt to change in drying, and to become rough and uneven.

To try if the colour be ſufficiently ſoftened, it ſhould be examined; and if it wets eaſily, after having been wrung on the peg, it wants copperas; but if on the contrary it ſoaks with a little difficulty, the colour is enough ſoftened.

On the other hand, too much copperas ſtiffens the ſilk conſiderably, making it harſh, and even depriving it of a great part of its luſtre. To remedy this, the ſilk when taken out of the liquor ſhould be wrung on the peg, and then immediately waſhed at the river, which carries off the ſuperfluous copperas.

The black greys, becauſe alumed and welded, make a ſeparate claſs. When the ſilk is alumed and cooled at the river, and the weld liquor prepared as for yellows, the ſilk is returned; and when the liquor is exhauſted, a part of it is thrown away, and the logwood decoction ſubſtituted in its place. The ſilk is again returned in this liquor; and when the logwood is exhauſted, ſome copperas may be added in a ſufficient quantity to blacken the colour. The ſilk is then waſhed, wrung, and finiſhed as uſual.

For iron grey, it is neceſſary to boil the ſame as for blues. This colour is much more beautiful when laid on a very white ground. It is more uſed in the manufacturing of ſtockings than any other colour, therefore generally wrought in ſhades; that is, many different ſhades made at the ſame time.

When the ſilk is waſhed and prepared as uſual, you make the liquor of river or well water, no matter which; but either muſt be cold.

If river water, the logwood decoction made with river water is added, ſufficient to produce the dark ſhade required; the ſilk is then dipped, and when finiſhed it is wrung and hung up. A part of the liquor is then thrown away and repleniſhed with water for the following ſhades, and ſo on to the lighteſt, carefully dividing; that is, preſerving an equal diſtance between the ſhades.

When all is finiſhed with the logwood, the dark ſhades are put again on the rods, to be dipped in a new liquor with the addition of copperas; the remaining lighter ſhades are then dipped in the ſame liquor, but without the copperas addition: if, however, the ſecond ſhade is not enough ſoftened, a little copperas muſt be added. This defect is eaſily perceived in the dipping, as we have before obſerved.

When arrived at the lighteſt ſhades, care ſhould be taken that the liquor be not overcharged with copperas, which is eaſily perceived by its having a reddiſh caſt; in which caſe ſome of the liquor ſhould be thrown away and repleniſhed with water, too much copperas producing the ſame effect with regard to theſe ſhades as the preceding.

When the liquor is made with well water, the logwood decoction ſhould alſo be made of well water. This being added to the liquor, the darkeſt ſhades are firſt dipped as in the preceding proceſs. When the ſilk has ſufficiently drawn, it is taken out, and the following ſhades are then dipped, but without repleniſhing, the colour being much better and clearer without the river water.

When all the ſhades are complete, you ſoften with copperas, in the ſame manner as above deſcribed; the ſilk is afterwards waſhed, and if neceſſary beetled.

To diſcharge greys, that is when the ſhades are too dark and too full, you put ſome tartar pounded in a mortar and ſifted into a bucket or ſmall trough; you then pour over it ſome boiling water. The cleareſt of this liquor is afterwards put in a trough, and the ſilks returned in it; by which operation a part of the colour is immediately diſcharged.

If the ſilk does not inſtantly take an equal colour, a little more tartar muſt be added as above mentioned.

The ſilk thus diſcharged of its ſuperfluous colour is once beetled at the river, and afterwards dipped in hot water, without any other addition. This laſt operation reſtores in part what it had loſt by the tartar; but to try the colour it ſhould be wrung on the peg.

The tartar always deſtroying ſome part of this colour, it ſhould be reſtored with a freſh liquor made for the purpoſe, and then ſoftened with copperas as uſual.

If the ſilk has been alumed, then the hot water may be omitted after the beetling; the hot water is, however, always of uſe in removing the harſhneſs occaſioned by the tartar.

To diſcharge iron greys when too dark, they ſhould be ſulphured, afterwards beetled at the river, and then again dipped in a freſh liquor ſimilar to the firſt.

This method of diſcharging iron greys is preferable to either tartar or lemon juice, theſe ingredients giving them a ground that does not eaſily yield even to the boiling with ſoap, which conſequently ſpoils the colour; whereas the ſulphuring almoſt entirely whitens the ſilk by totally deſtroying the logwood.

For greys in the raw, the ſilk ſhould be as white as for common colours, except the black grey, for which the natural yellow would be no diſadvantage. Having ſoaked the raw ſilk, the proceſs is then the ſame for producing theſe ſhades as on boiled ſilk.

84
Of dyeing cotton or linen black.

Cotton or linen receive a black colour with ſtill more difficulty than ſilk. "The various proceſſes (ſays M. de Apligny) for dyeing black, agree in the ſole intention of introducing within the pores of the ſtuff ferruginous particles diſſolved in different menſtrua, and of precipitating them on the ſtuff by means of aſtringent ſubſtances furniſhed with phlogiſton capable of colouring iron black. The beſt method therefore of ſucceeding, is to chooſe a ſolvent capable of dividing the particles ſo minutely that the calx may not injure the ſtuff. Copperas or green vitriol are uſed in theſe proceſſes; but the iron it contains is by no means in a ſtate of perfect diviſion, on account of the phlogiſton obſtinately retained by it, which facilitates its union with the acid without the iron being perfectly diſſolved. It is for this reaſon, doubtleſs, that a ſolution of green vitriol in water depoſites in lime a ſpecies of ochre; which, according to M. Geoffroy, ſeems to be an extraneous ſubſtance. For the ſame reaſon the ſpirit of nitre, ſaturated with iron, will diſſolve ſtill more, by abandoning the groſſer particles of what is held in ſolution, and of which it retains only the phlogiſton.

85
Cauſe of the rottenneſs frequent in black ſtuffs.

"This being the caſe, whenever copperas is uſed in dyeing of black, the ſtuffs dyed are generally harſh to the feel and conſiderably damaged; becauſe the groſs particles of the iron being only divided, and not diſſolved by the vitriolic acid of the copperas, overfill the pores of the ſtuff into which they had entered, and by their hardneſs extending the partition of theſe pores, force them aſunder. M. Hellot very well obſerves, that cloth dyed black without a blue or root ground requires a greater quantity of copperas, by which the ſtuff is rendered rotten; but I have alſo remarked, that when diſſolving the ruſt of iron in vinegar, either for yellow or for the black of painted linens, it is apt to tear in the parts where theſe colours are applied, particularly if there has been no attention to take off the groſſer earth by ſcumming the ſolution. To this

this earth therefore the rottenneſs of black ſtuff may be attributed; and not, as vulgarly imagined, to the ſalt of vitriol, nor to any other burning cauſe.

“ And therefore, in order to render the colour more equal, and the ſtuffs leſs damaged, the beſt method for black is to uſe a ſolution of iron perfectly divided. Conſequently, as experience daily teaches, thoſe acids which attack the iron too rapidly are the leaſt proper to produce a perfect ſolution of this metal. Weak acids are therefore preferable; which, notwithſtanding their ſlow operation, penetrate entirely, dividing it into impalpable particles. Black compoſitions alſo ſucceed much better in proportion as the black liquor is older, and conſequently the ſolution of the iron more complete. The manufacturers in India are ſo truly ſenſible of this conſequence, that many of them preſerve their black vats for more than 20 years. In the ſtates of Genoa, Florence, and Naples, every manufacturing city has a place of reſerve, called the *Seraglio*, where at the public expence eight or ten vats are continually ſupported. Theſe vats have been ſet from 300 to 400 years, more or leſs; that is, prepared for the dipping of ſilk deſigned for black, and requiring only to be ſupplied with proper drugs in proportion as they are diminiſhed by uſe. The ground remaining always the ſame, forms a kind of leaven, by which the fermentation of the neceſſary additional drugs is aſſiſted.

86
Compoſitions for dyeing black improved by age.

87
Rouen proceſs for dyeing cotton or linen black.

“ The proceſs at Rouen for dyeing linen and cotton thread black, is firſt to give it a ſky-blue ground, and then to wring and dry. It is afterwards galled, a quarter of a pound of galls for every pound of the ſubſtance (as for reds); having remained 24 hours in the gall liquor, it is again wrung and dried.

“ About five quarts of the black liquor for every pound is then poured into a trough. The cotton is then dipped and worked with the hand, pound by pound, for about a quarter of an hour, then wrung and aired. This operation is twice repeated, adding each time a freſh quantity of the black liquor carefully ſcummed. It is again aired, wrung, waſhed at the river, well drained, and dried.

“ When this cotton is to be dyed, about one pound of the rind of the alder-tree for every pound of thread is put into a copper and boiled in a ſufficient quantity of water during one hour. About half the liquor that had been uſed for the galling is then added, with about half the weight of the rind of the alder of ſumach. The whole is again boiled for two hours, after which it is ſtrained through a ſieve. When it is cold, the cotton is dipped in it on the rods, and worked pound by pound; from time to time airing, and returning it into the liquor; where having remained 24 hours, it is wrung and dried.

“ For ſoftening this cotton when too harſh, it is the cuſtom to ſoak it in the remainder of the weld-liquor that had been uſed for other colours, adding a little of the logwood-liquor. It is then taken out, and inſtantly plunged into a trough of warm water, into which had been poured about an ounce of the oil of olives for every pound of the ſubſtance: it is then wrung and dried.

88
Proceſs of the Abbé Mazeas.

“ M. l'Abbé Mazéas has given a proceſs for the dyeing of linen and cotton thread black, by maddering after having prepared with the ſickiou of the Adrianople red, galling and dipping in an aſtringent compoſed of lime-water and green copperas calcined. This proceſs, though long and expenſive, is in my mind no better than thoſe I have juſt deſcribed. In order to obtain a permanent black, it is my opinion that we muſt ſtill have recourſe to the black reſulting from a combination of the three primitive colours, until we diſcover feculæ capable of yielding a direct black. I ſhall now deſcribe a proceſs in which I myſelf have ſucceeded perfectly.

“ To dye linen and cotton thread black by a combination of colours, it is neceſſary to begin by cleanſing the thread as uſual by galling, in the ſame manner as mentioned in the article upon red, aluming afterwards, and then dipping in a weld-liquor. When taken out of this liquor, it muſt be dyed in a decoction of logwood, to which has been added a quarter of a pound of blue vitriol for every pound of the ſubſtance. It is then taken out, waſhed at the river, wrung, and waſhed ſeveral times, but not wrung hard. It is at laſt dyed in a madder liquor, about half a pound of this dye for every pound of the ſubſtance. It is needleſs to repeat here the manner of galling, aluming, and welding, &c. having deſcribed them above. By this proceſs we may reſt aſſured of obtaining a very beautiful and permanent black, that will not be liable to be diſcharged, provided that after having been dyed the thread be dipped in a boiling ſoap-liquor.

“ Several different ſhades of grey are diſtinguiſhed in the art of dyeing; *viz.* black-grey, iron-grey, ſlate-grey, thorn-grey, agate-grey, &c. It is eaſy to conceive, that grey in general, being a mixture of black and white, its different ſhades can be obtained only by introducing into the ſubject a ſmall quantity of matter, by which the rays of light are abſorbed in ſuch a manner, that ſome of the pores not being occupied, reflect all the rays, and preſent to the eye a grey colour by means of the black particles contained in the intermediate pores. This operation in dyeing is therefore preciſely the ſame as in painting, which produces grey by a mixture of lamp-black and of white lead.

“ It would be too tedious, and even ſuperfluous, to deſcribe the different proceſſes for the ſeveral greys juſt mentioned. The dyer will be better able to judge of theſe ſhades by his eye than by any particular rules. All that can be ſaid is, that it is the common practice to give a blue ground to black-grey, iron-grey, and ſlate-grey; but to none of the others. Theſe ſhades require aluming in proportion to the ſhade wanted, and are even frequently galled with liquors that had been previouſly uſed.

“ The thread having been firſt galled, wrung, and dried, is dipped on the rods in a trough full of cold water, adding an arbitrary quantity of the black liquor and of the logwood decoction. The thread is then worked pound by pound, waſhed, wrung, and dried.

“ It is poſſible to produce more permanent greys by the two following proceſſes. Firſt, by galling the thread, by dipping in a very weak black vat or liquor, and afterwards maddering. Secondly, by dipping the thread in a very hot ſolution of cryſtals of tartar, lightly wringing, and then drying. The thread is then dyed in a decoction of logwood. It appears black; but by dipping the thread, and working it attentively in a hot ſolution of ſoap, the ſuperfluous dye being diſcharged,

ged, it remains a ſlate-grey, very pretty and very permanent."

Having deſcribed in ſuch a particular manner the methods of dyeing the primitive colours, there can be very little difficulty in comprehending the management of thoſe which proceed from a mixture of them. But though an infinite number of different ſhades may be formed from thoſe already mentioned, we are not to imagine that a good colour will be produced by the mixture of any two at random. Thus, though you mix blue and ſcarlet together in any way you pleaſe in order to produce a purple, the colour will neither be good nor uniform, owing to the oppoſite action of the acid and alkaline ingredients by which theſe two primitive colours are ſtruck. With crimſon the caſe is altered: for, as we have already ſeen, that colour is produced in the greateſt perfection where volatile alkali is concerned; and therefore the alkaline ingredients of the blue, which can only tend to heighten that property in the other colour, have no ſuch pernicious tendency. From a mixture of blue and crimſon, therefore, are produced columbine, purple, amaranth, penſy, violet, with innumerable other ſhades, varying according to the depth of the original colours employed. In all theſe compound colours, it is neceſſary to dye the ſtuff completely of one colour, and then proceed with it for the other exactly as if it had been quite white. In the preſent caſe, you muſt begin with blue; becauſe, though the indigo cannot be hurt by the ingredients neceſſary for dyeing crimſon, yet the cochineal would be very conſiderably injured by the lime uſed for diſſolving the indigo. Colours of an inferior kind are produced from madder.

Blue and yellow produce a green, which is always eſſentially the ſame; though there are alſo innumerable ſhades of it which go by different names, as yellow-green, pale-green. bright-green, graſs-green, ſea-green, olive-green, &c. &c. Theſe are all dyed by the general method already mentioned, *viz.* a yellow dye ſuperadded to a blue ground; though they differ in ſome particulars in reſpect to the various ſhades above mentioned.

For yellow-greens, M. Hellot directs the ſtuff to be a fine light blue, boiled with the common quantities of alum and tartar, and then dipped in the yellow dye in order to receive a ſtrong colour, that the yellow may predominate. For thoſe ſhades called *cabbage* and *parrot greens*, or any others more inclining to blue, it is requiſite that the latter ſhould be very deep and the yellow dye weak, or that a ſmaller quantity of ſalts ſhould be uſed in the preparation. This laſt method, however, is not approved of by M. Hellot; and indeed it is natural to think, that a great quantity of colour with little of the preparation neceſſary to make it adhere and brighten it, muſt be much leſs durable, as well as leſs beautiful, than one where the colour and preparation are in due proportion to one another.

A very beautiful green will be produced by dipping a deep blue cloth in the decoction of the virga aurea Canadienſis, provided the ſtuff after being dyed blue has been boiled in a ſolution of three parts of alum and one of white tartar. This green is equally permanent with that dyed with weld. A very permanent green is alſo produced by the bark of the aſh-tree, but leſs beautiful than the other. A duck's-wing green is produced by uſing the root of the ſharp-pointed dock groſsly powdered and in ſufficient quantity. For this the ſtuff muſt be dyed firſt of a dark blue; then well ſcoured, and afterwards boiled in a ſolution of four parts of alum and one of tartar; and, laſtly, it muſt be boiled full two hours with the other colouring ingredient the dock-root. By this root alſo many various ſhades of colour may be obtained from the paleſt yellow to a tolerable olive; ſo that our author thinks it is a conſiderable acquiſition in the art of dyeing.

94
Dutch method of dyeing ſea-green.

Sea-green is uſually dyed, according to M. Hellot, with verdigris; and the following, he ſays, is the Dutch method of doing it, and which produces a more permanent colour than uſually is obtained by means of that ingredient. "Two cauldrons are to be placed at a little diſtance from each other; in one of which you put two pieces of cloth of 40 or 50 ells in length, with eight or ten pounds of white ſoap ſhaved, and which muſt be perfectly diſſolved. When the mixture is ready to boil, the ſtuff ſhould be immerſed, and ſuffered to boil a full half hour. In the other cauldron you muſt prepare another liquor; and when that is quite hot, you put into it a clean linen bag, containing eight or ten pounds of blue vitriol, and ten or twelve of lime, each of them well pulverized and mixed together; it being neceſſary that the mixture ſhould be as accurate as poſſible. This bag ſhould be moved about in the water, hot, but not boiling, till the vitriol is diſſolved. A winch is then to be fixed on in the uſual manner; but which ought to be carefully wrapped round with a clean linen cloth very tight and well ſewed. One end of the cloth is fixed on the winch, which is then turned ſwiftly round, that the cloth may paſs ſwiftly from the ſoap-cauldron into that with the vitriol; and here it is turned more ſlowly, that it may have time to imbibe the particles of the copper, which by means of the lime were diffuſed in the liquor by ſeparating and precipitating them from the blue vitriol in which they were contained. The cloth is left in this liquor, which ſhould never boil till the cloth has taken the ſea-green colour deſired. It is then to be taken out, drained on the winch, and aired by the hiling. It ſhould hang till it is perfectly cold before it be waſhed at the river. If it touches wood it will be ſpotted; for which reaſon, the winch, and every thing of wood over which it muſt paſs, ought to be well covered with linen."

On examining this proceſs by the principles of chemiſtry, it appears to be no other than impregnating the cloth with a ſolution of copper in fixed alkali. It is undoubtedly a miſtake to ſay, that it is done by verdigris; for no verdigris can be formed from blue vitriol, lime, and ſoap. All that we can ſay of it is, that it is cloth impregnated with a combination of copper with fixed alkali; which being naturally extremely ready to unite with water, and having very little attraction for the cloth, the latter may be ſuppoſed to be painted rather than dyed with it. A much better method. therefore, ſeems to be that recommended by M. Hellot, of firſt dyeing the ſtuff a very light blue, and then giving the neceſſary yellow with virga aurea.

Theſe receipts may ſerve as ſpecimens of the methods of dyeing all kinds of mixed colours. There are, however, methods of producing both a blue and green from indigo itſelf, by diſſolving it in acids; and

95 Saxon blue and green. the colours ſo produced are called *Saxon blues* and *greens.* Being periſhable colours, they are now ſeldom uſed; though Mr Wolfe ſome time ago publiſhed a receipt in the Philoſophical Tranſactions for preparing them after an improved method. This method, for the blue, was to diſſolve indigo in concentrated oil of vitriol by digeſting them in the heat of boiling water inſtead of ſand, which had formerly been uſed, and was apt to ſpoil the colour. After the ſolution of the indigo, the liquor may be weakened at pleaſure; and any piece of cloth dipped in it will imbibe a dye deeper or lighter according to the quantity of colour it contains. This colour is very beautiful, but apt to prove unequal; and, as has been already ſaid, extremely periſhable. For the Saxon green it is neceſſary to have a yellow from indigo alſo, which is obtained by diſſolving it in ſpirit of nitre. Mr Wolfe recommends an ounce and an half of powdered indigo to be mixed with two ounces of ſpirit of nitre diluted with four times its quantity of water. The mixture is then to ſtand for a week, and at the end of that ſpace is to be digeſted in a ſand heat for an hour or more; after which four ounces more of water are to be added. The ſolution, when filtered, will be of a fine yellow colour. Strong ſpirit of nitre, when mixed undiluted with indigo, is apt to ſet fire to it; for which reaſon the water is added. Even in its diluted ſtate, it will froth and run over if the digeſtion be performed within 24 hours after the mixture; and on this account it is allowed to remain a week in the cold. One part of the ſolution of indigo in the acid of nitre, mixed with four or five parts of water, will dye ſilk or cloth of the paleſt yellow colour, or of any ſhade to the deepeſt, by letting them boil a longer or ſhorter time, adding water as the liquid evaporates. The addition of alum makes the colour more laſting. None of the colour ſeparates in the operation but what is imbibed by the cloth, and therefore this liquid goes very far in dyeing. That part of the indigo which remains undiſſolved in the vitriolic acid, when collected by filtration and diſſolved in ſpirit of nitre, will dye ſilk and wool of all ſhades of brown inclining to yellow.

96 M. de Apligny's remarks on this proceſs. On the proceſs for dyeing Saxon blue M. de Apligny obſerves, that there is no real ſolution of the indigo in the acid of vitriol, but that it is only divided into very fine particles and ſuſpended in the liquor; neither can any alteration be made in it by an alteration in the proceſs. Nor does this make any exception to the general rule in chemiſtry, that acids diſſolve and redden the blue colouring matter of vegetables; it not being their nature to act upon feculæ ſuch as indigo, but upon vegetable juices, the colour of which depends on the ſalts and eſſential oil of the plant. For the truth of his aſſertion he appeals to the appearance of the liquor prepared for dyeing Saxon blue.

97 Materials for dyeing leſs numerous than might be ſuppoſed. From the vaſt profuſion of colours which nature exhibits in the flowers which grow every where around us, it is natural to think that the materials for dyeing might be had in the greateſt plenty without any neceſſity of having recourſe to foreign countries. But this is far from being the caſe: for ſcarce one of our blue or red flowers can be made to communicate any durable colour to cloth; while, on the other hand, almoſt all the yellow ones may be made to do ſo. Numberleſs experiments have been made to determine the plants which might be really uſeful to dyers; and moſt that have yet been found fit for their purpoſe in Britain are comprehended in the following liſt.

| | |
|---|---|
| YELLOWS. | |
| Bark of bucktborn, | *Rhamnus catharticus.* |
| berry-bearing alder, | ——— *frangula.* |
| berberry, | *Berberis vulgaris.* |
| plum-tree, | *Prunus domeſtica.* |
| apple-tree, | *Pyrus malus.* |
| hornbeam, | *Carpinus betulus.* |
| Root of meadow-rue, | *Thalictrum flavum.* |
| common nettle, | *Urtica dioica.* |
| Herb, ſaw-wort, | *Serratula tinctoria.* |
| buſhy hawkweed, | *Hieracium umbellatum.* |
| hemp-agrimony, | *Bidens tripartita.* |
| gale, or Dutch myrtle, | *Myrica gale.* |
| ſweet willow, | *Salix pentandra.* |
| birch-tree, | *Betula alba.* |
| hedge-nettle, | *Stachys ſylvatica.* |
| ſpotted arſmart, | *Polygonum perſicaria.* |
| yellow looſeſtrife, | *Lyſimachia vulgaris.* |
| devil's-bit, | *Scabioſa ſucciſa.* |
| kidney-vetch, | *Anthyllis vulneraria.* |
| common yellow liverwort, | *Lichen parietinus.* |
| Flowers of St John's wort, | *Hypericum perforatum.* |
| REDS. | |
| Roots of ladies bedſtraw, | *Galium verum.* |
| herb woodroof, | *Aſperula tinctoria.* |
| ſorrel, | *Rumex acetoſa.* |
| tormentil, | *Tormentilla erecta.* |
| purple cinquefoil, | *Comarum paluſtre.* |
| PURPLES. | |
| Herb, or tops of wild marjoram, | *Origanum ſylveſtre.* |
| BLUES. | |
| Bark of the aſh, | *Fraxinus excelſior.* |
| Flowers of larkſpur, | *Delphinium conſolida.* |
| bell-flower, | *Campanula rotundifolia.* |
| Berries of black heath, | *Empetrum nigrum.* |
| GREENS. | |
| Herb of ragwort, | *Senecio Jacobæa.* |
| cow-weed, | *Chærophyllum ſylveſtre.* |
| Panicle of brome-graſs, | *Bromus ſecalinus.* |
| common reed, | *Arundo phragmites.* |
| BLACKS. | |
| Bark of oak, | *Quercus robur.* |
| Water horehound, | *Lycopus europæus.* |

Ho cha l n dy As it is often neceſſary to give another colour to ſtuffs which have been already dyed, it is plain, that it is as neceſſary for a dyer to know how to diſcharge colours as how to make the cloth imbibe them.—Concerning this, it is only neceſſary to obſerve, that alkaline ſalts are in general the beſt, and, where the colours are well dyed, the only means of diſcharging them. If a piece of cloth is dyed with logwood, and the colour ſtruck upon it with alum, that colour will be nearly diſcharged by oil of vitriol, or any other ſtrong acid; but if ſolution of tin has been employed in ſtriking the colour, acids have then no effect, and alkalies only can be employed. Neither will they diſcharge the colour totally, but the ſtuff muſt be bleached for ſome time to get out the remainder. If alkaline ſalts cannot be employed with ſafety to the ſtuff, it is then impoſſible to dye it any other colour than black; unleſs it be dyed a compound colour, of which the original one is a component part.

Concerning the weight that colours give to ſilk (in which it is moſt taken notice of, being ſold by weight, and a commodity of great price), it is obſerved, that one pound of raw ſilk loſeth four ounces by waſhing out the gums and the natural ſordes; that the ſame ſcoured ſilk may be raiſed to above thirty ounces from the remaining twelve, if it be dyed black with ſome materials. Of all the materials uſed in dyeing, eſpecially of black, nothing increaſes weight ſo much as galls, by which black ſilks are reſtored to as much weight as they loſt by waſhing out their gum; nor is it counted extraordinary, that blacks ſhould gain about four or ſix ounces in the dyeing upon each pound. Next to the galls, old fuſtic increaſes the weight about $1\frac{1}{2}$ in 12; madder, one ounce; weld, half an ounce; the blue vats in deep blues of the fifth ſtall give no conſiderable weight; neither do logwood, cochineal, nor even copperas, where galls are not uſed.

*Dyeing of Hats.* See Hats.

*Dyeing of Leather.* See Leather.

Dyeing, or *Staining*, of paper, wood, bone, marble, &c. See Bone, Marble, Paper, Wood, &c.

DYNASTY, among ancient hiſtorians, ſignifies a race or ſucceſſion of kings of the ſame line or family. Such were the dynaſties of Egypt. The word is formed from the Greek δυναςεια of δυναςευω, *to be powerful*, or *king*.

The Egyptians reckon 30 dynaſties within the ſpace of 36,525 years; but the generality of chronologers look upon them as fabulous. And it is very certain, that theſe dynaſties are not continually ſucceſſive, but collateral.

DYRRACHIUM (anc. geog.), a town on the coaſt of Illyricum, before called *Epidamnum*, or *Epidamnus*, an inauſpicious name, changed by the Romans to *Durrachium;* a name taken from the peninſula on which it ſtood. Originally built by the Corcyreans. A Roman colony (Pliny). A town famous in ſtory: its port anſwered to that of Brunduſium, and the paſſage between both was very ready and expeditious. It was alſo a very famous mart for the people living on the Adriatic; and the free admiſſion of ſtrangers contributed much to its increaſe: A contraſt to the conduct of the Apollonians; who, in imitation of the Spartans, diſcouraged ſtrangers from ſettling among them.

DYSÆ, in mythology, inferior goddeſſes among the Saxons, being the meſſengers of the great Woden, whoſe province it was to convey the ſouls of ſuch as died in battle to his abode, called *Valhall*, i. e. the hall of ſlaughter; where they were to drink with him and their other gods *cerevisia*, or a kind of malt liquor, in the ſkulls of their enemies. The *Dyſæ* conveyed thoſe who died a natural death to *Hela*, the goddeſs of hell, where they were tormented with hunger, thirſt, and every kind of evil.

DYSCRASY, among phyſicians, denotes an ill habit or ſtate of the humours, as in the ſcurvy, jaundice, &c.

DYSENTERY, in medicine, a diarrhœa or flux, wherein the ſtools are mixed with blood, and the bowels miſerably tormented with gripes. See Medicine-*Index*.

DYSENTERIC fever. *Ibid.*

DYSERT, a parliament town of Scotland, in the county of Fife, ſituated on the northern ſhore of the frith of Forth, about 11 miles north of Edinburgh.

DYSOREXY, among phyſicians, denotes a want of appetite, proceeding from a weakly ſtomach.

DYSPEPSY, a difficulty of digeſtion.

DYSPNOEA, a difficulty of breathing, uſually called *aſthma*.

DYSURY, in medicine, a difficulty of making urine, attended with a ſenſation of heat and pain. See Medicine-*Index*.

DYTISCUS, water-beetle, in zoology, a genus of inſects of the order of the coleoptera; the antennæ of which are ſlender and ſetaceous, and the hind feet are hairy, and formed for ſwimming. There are 23 ſpecies, diſtinguiſhed by their antennæ, the colour of the elytra, &c.

Plate CLXIV.

The larvæ of the dytiſcus are often met with in water. They are oblong, and have ſix ſcaly feet. Their body conſiſts of eleven ſegments. The head is large, with four filiform antennæ and a ſtrong pair of jaws. The laſt ſegments of their body have rows of hairs on the ſides; and the abdomen is terminated by two ſpines charged with the like hairs, forming a kind of plumes. Theſe larvæ are frequently of a greeniſh variegated brown: they are lively, active, and extremely voracious: they devour and feed upon other water-inſects, and often tear and deſtroy each other. The perfect inſect is little inferior to its larvæ in voraciouſneſs, but it can only exerciſe its cruelty on the larvæ; the perfect inſects, like himſelf, being ſheltered by the kind of ſcaly cuiraſs with which they are armed. This creature muſt be touched cautiouſly; for beſides its power of giving a ſevere gripe with its jaws, it has moreover, under the thorax, another weapon, a long ſharp ſpine, which it will drive into one's fingers by the effort it makes to move backwards. The eggs of the dytiſci are rather large, and are by them incloſed in a kind of ſilky duſkiſh cod, of a ſtrong and thick texture, in form round, and terminated by a long appendix or ſlender tail, of the ſame ſubſtance. Theſe cods are often found in the water, and from them are brought forth the eggs and larvæ of the dytiſci. The ſtrength of theſe cods probably ſerves the inſect to defend their eggs from the voraciouſneſs of ſeveral other aquatic inſects, and even from that of their fellow-dytiſci, who would not ſpare them.

Many ſpecies of the perfect inſect are common in ſtagnated waters, which they quit in the evening to fly about. They ſwim with incredible agility, making uſe of their hinder-legs after the faſhion of oars. The elytra of the females are in general furrowed, and thoſe of the male plain: when they firſt arrive at their perfect ſtate, their elytra are almoſt tranſparent, and in many ſpecies of a beautiful dun colour, mingled with ſhades of greeniſh brown. The beſt method of

Dyvour.

catching them is with a hand-net or ſieve; for they are ſo nimble, and exerciſe their defenſive weapons ſo often, and with ſuch painful ſucceſs, to thoſe who endeavour to catch them, that they are very often obliged to let them eſcape; the eaſieſt way to kill them, is to let them fall into boiling hot water, which inſtantly deſtroys them.

DYVOUR, in Scots law; otherwiſe *Bare-man:* A perſon who, being involved in debt, and unable to pay the ſame,—for avoiding impriſonment and other pains, makes ceſſion of his effects in favour of his creditors; and does his *devoir* and duty to them, proclaiming himſelf bare man and indigent, and becoming debt-bound to them of all that he has. The word is uſed in the ſame ſenſe as BANKRUPT: ſee that article; and LAW N clxxxv, 11, 12. clxxii. 10, 11, 12, &c.

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# E.

E, Eachard.

E, THE ſecond vowel, and fifth letter of the alphabet. The letter E is moſt evidently derived from the old character Ǝ in the ancient Hebrew and Phœnician alphabets, inverted by the Greeks to this poſition E, and not from the Hebrew He ה. From the ſame origin is alſo derived the Saxon *e*, which is the firſt letter in their alphabet that differs from the Latin one. It is formed by a narrower opening of the larynx than the letter A; but the other parts of the mouth are uſed nearly in the ſame manner as in that letter.

It has a long and ſhort ſound in moſt languages. The ſhort ſound is audible in *bed*, *fret*, *den*, and other words ending in conſonants: its long ſound is produced by a final *e*, or an *e* at the end of words; as in *glebe*, *here*, *hire*, *ſcene*, *ſphere*, *interfere*, *revere*, *ſincere*, &c. in moſt of which it ſounds like *ee;* as alſo in ſome others by coming after *i*, as in *believe*, *chief*, *grief*, *reprieve*, &c. and ſometimes this long ſound is expreſſed by *ee*, as in *bleed*, *beer*, *creed*, &c. Sometimes the final *e* is ſilent, and only ſerves to lengthen the ſound of the preceding vowel, as in *rag*, *rage*, *ſtag*, *ſtage*, *hug*, *huge*, &c. The ſound of *e* is obſcure in the following words, *oxen*, *heaven*, *bounden*, *fire*, *maſſacre*, *maugre*, &c.

The Greeks have their long and ſhort *e* which they call *epſilon* and *eta*. The French have at leaſt ſix kinds of *e*'s: the Latins have likewiſe a long and ſhort *e;* they alſo write *e* inſtead of *a*, as *dicem* for *dicam*, &c. and this is no doubt the reaſon why *a* is ſo often changed into *e* in the preter tenſe, as, *ago*, *egi;* *facio*, *feci*, &c.

As a numeral, E ſtands for 250, according to the verſe,

E, *quoque ducentos et quinquaginta tenebit.*

In muſic it denotes the tone *e-la-mi*. In the kalendar it is the fifth of the dominical letters. And in ſea-charts it diſtinguiſhes all the eaſterly points: thus, E alone denotes Eaſt; and E. by S. and E. by N. Eaſt by South, and Eaſt by North.

EACHARD (John), an Engliſh divine of great learning and wit in the 17th century, bred at Cambridge, author (in 1670) of *The Grounds and Occaſions of the Contempt of the Clergy and Religion inquired into.* In 1675 he was choſen maſter of Catharine-hall upon the deceaſe of Dr John Lightfoot; and the year following was created D. D. by royal mandate. He died in 1695.

EACHARD (Laurence), an eminent Engliſh hiſtorian of the 18th century, nearly related to Dr John Eachard. He was the ſon of a clergyman, who, by the death of his elder brother, became maſter of a good eſtate in Suffolk. He was educated in the univerſity of Cambridge, entered into holy orders, and was preſented to the living of Welton and Elkington in Lincolnſhire, where he ſpent above 20 years of his life, and diſtinguiſhed himſelf by his writings, eſpecially his Hiſtory of England, which was attacked by Dr Edmund Calamy and by Mr John Oldmixon. His "General Eccleſiaſtical Hiſtory from the Nativity of Chriſt to the firſt Eſtabliſhment of Chriſtianity by Human Laws under the emperor Conſtantine the Great," has paſſed through ſeveral editions. He was inſtalled archdeacon of Stowe and prebend of Lincoln in 1712. He died in 1730.

EADMERUS, an eſteemed hiſtorian, was an Engliſhman; but his parents, and the particular time and place of his nativity, are not known. He received a learned education, and very early diſcovered a taſte for hiſtory, by recording every remarkable event that came to his knowledge. Being a monk in the cathedral of Canterbury, he had the happineſs to become the boſom-friend and inſeparable companion of two archbiſhops of that ſee, St Anſelm and his ſucceſſor Ralph. To the former of theſe he was appointed ſpiritual director by the Pope; and that prelate would do nothing without his permiſſion. In the year 1120, he was ſent for by king Alexander I. of Scotland, to be raiſed to the primacy of that kingdom; and having obtained leave of king Henry and the archbiſhop of Canterbury, he departed for Scotland, where he was kindly received by the king; and on the third day after his arrival, he was elected biſhop of St Andrew's with much unanimity. But on the day after his election, an unhappy diſpute aroſe between the king and him, in a private conference about his conſecration. Eadmerus having been a conſtant companion of the late and of the preſent archbiſhops of Canterbury, was a violent ſtickler for the prerogatives of that ſee. He therefore told the king, that he was determined to be conſecrated by none but the archbiſhop of Canterbury, who he believed to be the primate of all Britain. Alexander, who was a fierce prince, and ſupported the independency of his crown and kingdom with great ſpirit, was ſo much offended, that he broke off the conference in a violent paſſion, declaring, that the ſee of Canterbury had no pre-eminency over that of St Andrew's. This breach between the king and the biſhop-elect became daily wider, till at length Eadmerus, deſpairing of recovering the royal favour, ſent his paſtoral ring to the king, and laid his paſtoral ſtaff on the high altar, from whence he had taken it, and abandoning his biſhopric returned to England. He was kindly received by the archbiſhop and clergy of Canterbury, though they diſapproved of his ſtiffneſs, and thought him too haſty in forſaking the honourable ſtation to which he had been called. Nor was it long before Eadmerus became ſenſible of his error, and deſirous of correcting it. With this view he wrote a long ſubmiſſive letter to the king of Scotland, intreating his leave to return to his biſhopric, promiſing compliance with his royal pleaſure in every thing reſpecting his conſecration, which was accompanied by an epiſtle to the ſame purpoſe from the archbiſhop. Theſe letters, however, which were written A. D. 1122, did not produce the deſired effect. But Eadmerus is moſt worthy of the grateful remembrance of poſterity for his hiſtorical works, particularly for his excellent hiſtory of the affairs of England in his own time, from A. D. 1066 to A. D. 1122; in which he hath inſerted many original papers, and preſerved many important facts, that are no where elſe to be found. This work hath been highly commended, both by ancient and modern writers, for its authenticity, as well as for regularity of compoſition and purity of ſtyle. It is indeed more free from legendary tales than any other work of this period; and it is impoſſible to peruſe it with attention, without conceiving a favourable opinion of the learning, good ſenſe, ſincerity, and candour of its author.

**EAGLE**, in ornithology. See Falco.

**Eagle**, in heraldry, is accounted one of the moſt noble bearings in armoury; and, according to the learned in this ſcience, ought to be given to none but ſuch as greatly excel in the virtues of generoſity and courage, or for having done ſingular ſervices to their ſovereigns; in which caſes they may be allowed a whole eagle, or an eagle naiſſant, or only the head or other parts thereof, as may be moſt agreeable to their exploits.

The eagle has been borne, by way of enſign or ſtandard, by ſeveral nations. The firſt who ſeem to have aſſumed the eagle are the Perſians; according to the teſtimony of Xenophon. Afterwards, it was taken by the Romans; who, after a great variety of ſtandards, at length fixed on the eagle, in the ſecond year of the conſulate of C. Marius: till that time, they uſed indifferently wolves, leopards, and eagles, according to the humour of the commander.

The Roman eagles, it muſt be obſerved, were not painted on a cloth or flag; but were figures in relievo, of ſilver or gold, borne on the tops of pikes; the wings being diſplayed, and frequently a thunder-bolt in their talons. Under the eagle on the pike, were piled bucklers, and ſometimes crowns. Thus much we learn from the medals.

Conſtantine is ſaid to have firſt introduced the eagle with two heads, to intimate, that though the empire ſeemed divided, it was yet only one body. Others ſay, that it was Charlemagne who reſumed the eagle as the Roman enſign, and added to it a ſecond head; but that opinion is deſtroyed, by an eagle with two heads, noted by Lipſius, on the Antonine column; as alſo by the eagle's only having one head on the ſeal of the golden bull of the emperor Charles IV. The conjecture, therefore, of F. Meneſtrier appears more probable, who maintains, that as the emperors of the eaſt, when there were two on the throne at the ſame time, ſtruck their coins with the impreſſion of a croſs, with a double traverſe, which each of them held in one hand, as being the ſymbol of the Chriſtians; the like they did with the eagle in their enſigns; and inſtead of doubling their eagles, they joined them together, and repreſented them with two heads. In which they were followed by the emperors of the Weſt.

F. Papebroche wiſhes that this conjecture of Meneſtrier were confirmed by ancient coins; without which, he rather inclines to think the uſe of the eagle with two heads to be merely arbitrary; though he grants it probable, that it was firſt introduced on occaſion of two emperors in the ſame throne.

The eagle on medals, according to M. Spanheim, is a ſymbol of divinity and providence; and, according to all other antiquities, of empire. The princes on whoſe medals it is moſt uſually found, are the Ptolemies and the Seleucides of Syria. An eagle with the word CONSECRATIO, expreſſes the apotheoſis of an emperor.

**Eagles**, a name found very frequently in the ancient hiſtories of Ireland, and uſed to expreſs a ſort of baſe money that was current in that kingdom in the firſt years of the reign of Edward I. that is, about the year 1272. There were, beſides the eagles, lionines, roſades, and many other coins of the ſame ſort, named according to the figures they were impreſſed with.

The current coin of the kingdom was at that time a compoſition of copper and ſilver, in a determined proportion, but theſe were ſo much worſe than the ſtandard proportion of that time, that they were not intrinſically worth quite half ſo much as the others. They were imported out of France and other foreign countries. When this prince had been a few years eſtabliſhed on the throne, he ſet up mints in Ireland for the coining ſufficient quantities of good money, and then decried the uſe of theſe eagles, and other the like kinds of baſe coins, and made it death, with confiſcation of effects, to import any more of them into the kingdom.

**Eagle**, in aſtronomy, is a conſtellation of the northern hemiſphere, having its right wing contiguous to the equinoctial. See Aquila.

There are alſo three ſeveral ſtars, particularly denominated among the Arab aſtronomers, *naſr*, i e. "eagle." The firſt, *naſr ſohail*, the "eagle of canopus," called alſo *ſitareh jemen*, the ſtar of Arabia Felix, over which it is ſuppoſed to preſide; the ſecond, *naſr althair*, the "flying eagle;" and the third, *naſr alvake*, the "reſting eagle."

*White* **Eagle**, is a Poliſh order of knighthood, inſtituted in 1325 by Uladiſlaus V. on marrying his ſon

Caſimire with a daughter of the great-duke of Lithuania.

The knights of this order were diſtinguiſhed by a gold chain, which they wore on the ſtomach, whereon hung a ſilver eagle crowned.

*Black Eagle*, was a like order, inſtituted in 1701 by the elector of Brandenburgh, on his being crowned king of Pruſſia.

The knights of this order wear an orange-coloured ribbon, to which is ſuſpended a black eagle.

Eagle, in architecture, is a figure of that bird anciently uſed as an attribute, or cognizance of Jupiter, in the capital and friezes of the columns of temples conſecrated to that god.

*Eagle-flower.* See Balsamine.

*Eagle-ſtone*, in natural hiſtory, a ſtone, by the Greeks called *ætites*, and by the Italians *pietra d'aquila*, as being ſuppoſed to be ſometimes found in the eagle's neſt. It is of famous traditionary virtue, either for forwarding or preventing the delivery of women in labour, according as it is applied above or below the womb. Matthiolus tells us, that birds of prey could never hatch their young without it, and that they go in ſearch for it as far as the Eaſt Indies. Bauſch has an expreſs Latin treatiſe on the ſubject. See Ætites.

EAGLET, a diminutive of eagle, properly ſignifying a young eagle. In heraldry, when there are ſeveral eagles on the ſame eſcutcheon, they are termed *eaglets*.

EALDERMAN, or Ealdorman, among the Saxons, was of like import with earl among the Danes.

The word was alſo uſed for an elder, ſenator, or ſtateſman. Hence, at this day, we call thoſe *aldermen* who are aſſociates to the chief officer in the common-council of a city or corporate town.

EAR, in anatomy. See there, n° 141.

Several naturaliſts and phyſicians have held, that cutting off the ear rendered perſons barren and unprolific; and this idle notion was what firſt occaſioned the legiſlators to order the ears of thieves, &c. to be cut off, leſt they ſhould produce their like.

The ear has its beauties, which a good painter ought by no means to diſregard; where it is well formed, it would be an injury to the head to be hidden. Suetonius inſiſts, particularly, on the beauties of Auguſtus's ears; and Ælian, deſcribing the beauties of Aſpaſia, obſerves, ſhe had ſhort ears. Martial alſo ranks large ears among the number of deformities.

Among the Athenians, it was a mark of nobility to have the ears bored or perforated. And among the Hebrews and Romans, this was a mark of ſervitude.

Loſs of one ear is a puniſhment enacted by 5 and 6 Edw. VI. cap. 4. for fighting in a church-yard; and by 2 and 3 Edw. VI. cap. 15. for combinations to raiſe the price of proviſions, labour, &c. if it be the third offence, beſide pillory, and perpetual infamy, or a fine of 40l.

By a ſtatute of Henry VIII. maliciouſly cutting off the ear of a perſon is made a treſpaſs, for which treble damages ſhall be recovered; and the offender is to pay a fine of ten pounds to the king. 37 Hen. VIII. cap. 6. § 4. In the index to the Statutes at Large, it is ſaid, that this offence may be puniſhed as felony, by 22 and 23 Car. II. cap. 1. § 7. commonly called *Coventry's act;* but ear is not mentioned in that ſtatute.

*Ear of Fiſhes.* See Comparative *Anatomy*, n° 167.

Ear, in muſic, denotes a kind of internal ſenſe, whereby we perceive and judge of harmony and muſical ſounds. See Music.

In muſic we ſeem univerſally to acknowledge ſomething like a diſtinct ſenſe from the external one of hearing; and call it a *good ear*. And the like diſtinction we ſhould probably acknowledge in other affairs, had we got diſtinct names to denote theſe powers of perception by. Thus a greater capacity of perceiving the beauties of painting, architecture, &c. is called a *fine taſte*.

Ear is alſo uſed to ſignify a long cluſter of flowers, or ſeeds produced by certain plants; uſually called by botaniſts *ſpica*. The flowers and ſeeds of wheat, rye, barley, &c. grow in ears. The ſame holds of the flowers of lavender, &c. We ſay the ſtem of the ear, i. e. its tube or ſtraw; the knot of the ear; the lobes or cells wherein the grains are incloſed; the beard of the ear, &c.

*Ear-Ach.* See (the *Index* ſubjoined to) Medicine.

*Ear-Pick*, an inſtrument of ivory, ſilver, or other metal, ſomewhat in form of a probe, for cleanſing the ear. The Chineſe have a variety of theſe inſtruments, with which they are mighty fond of tickling their ears; but this practice, Sir Hans Sloane obſerves, muſt be very prejudicial to ſo delicate an organ, by bringing too great a flow of humours on it.

*Ear-Ring.* See Pendent.

*Ear-Wax.* See Cerumen, and Anatomy, p. 764, col. 1.

EARWIG, in zoology. See Forficula.

EARING, in the ſea-language, is that part of the bolt-rope which at the four corners of the ſail is left open, in the ſhape of a ring. The two uppermoſt parts are put over the ends of the yard-arms, and ſo the ſail is made faſt to the yard; and into the lowermoſt earings, the ſheets and tacks are ſeized or bent at the clew.

EARL, a Britiſh title of nobility, next below a marquis, and above a viſcount.

The title is ſo ancient, that its original cannot be clearly traced out. This much, however, ſeems tolerably certain, that among the Saxons they were called *ealdormen*, *quaſi* elder men, ſignifying the ſame with *ſenior* or *ſenator* among the Romans; and alſo *ſchiremen*, becauſe they had each of them the civil government of a ſeveral diviſion or ſhire. On the irruption of the Danes they changed their names to *eorels*, which, according to Camden, ſignified the ſame in their language. In Latin they are called *comites* (a title firſt uſed in the empire), from being the king's attendants; *a ſocietate nomen ſumpſerunt, regis enim tales ſibi aſſociant.* After the Norman conqueſt they were for ſome time called *counts*, or *countees*, from the French; but they did not long retain that name themſelves, though their ſhires are from thence called *counties* to this day. It is now become a mere title: they have nothing to do with the government of the county; which is now entirely devolved on the ſheriff, the earl's deputy, or *vice-comes*. In writs, commiſſions, and other formal inſtruments, the king, when he mentions any peer of the degree of an earl, uſually ſtyles him "truſty and well-beloved *couſin*:" an appellation as ancient as the reign of Henry IV.; who being either by his wife, his mother, or his ſiſters, actually related or allied to every earl in the kingdom, artfully and conſtantly acknowledged that connection in all his letters and other public acts; whence the uſage has deſcended to his ſucceſſors, though the reaſon has long ago failed.

An earl is created by cincture of ſword, mantle of ſtate put upon him by the king himſelf, a cap and a coronet put upon his head, and a charter in his hand.

*Earl-Marſhal*. See MARSHAL.

EARNEST (ARRHÆ), money advanced to bind the parties to the performance of a verbal bargain. By the civil law, he who recedes from his bargain loſes his earneſt, and if the perſon who received the earneſt give back, he is to return the earneſt double. But with us, the perſon who gave it, is in ſtrictneſs obliged to abide by his bargain; and in caſe he decline it, is not diſcharged upon forfeiting his earneſt, but may be ſued for the whole money ſtipulated.

EARTH, among ancient philoſophers, one of the four elements of which the whole ſyſtem of nature was thought to be compoſed. See ELEMENT.

EARTHS, in chemiſtry, are defined by Cronſtedt to be ſuch ſubſtances as are not ductile, moſtly indiſſoluble in water or oil, and that preſerve their conſtitution in a ſtrong heat. Mr Bergman remarks that they are inſipid, and not ſoluble in 1000 times their weight of boiling water; though, by augmenting the heat as in Papin's digeſter, perhaps all the kinds we are yet acquainted with may be found capable of ſolution, eſpecially when precipitated from ſome other menſtruum; their ſurface being then greatly augmented. In the chain of nature they proceed by an inſenſible gradation towards the ſalts, ſo that they cannot be ſeparated but by artificial limits. A moderate heat does not change their form, nor are they diſſipated by a more violent one. Dr Black defines them to be ſuch bodies as are not ſoluble in water, not inflammable, and their ſpecific gravity not more than four times the weight of water. They are diſtinguiſhed from the ſalts by their inſolubility; from the inflammables, by their want of inflammability; and from the metals, by their deficiency in weight. Some objections have been made to this definition, as not being ſtrictly applicable to thoſe earths which are known to be ſoluble in water: but this objection may be accounted of little weight, when we conſider the extreme diſparity betwixt the ſolubility of the earths and ſalts, a few grains of the earths ſaturating ſome pounds of water; ſo that if they have any ſolubility, they muſt be allowed to poſſeſs but a very ſmall ſhare of it.

Another property, which is not uſually taken into the definition, makes nevertheleſs a remarkable part of the character of earthy bodies, viz. their great fixedneſs in the fire. All the other claſſes of bodies ſhow themſelves volatile in more or leſs violent degrees of heat. All the ſalts can be made to evaporate; all the inflammable ſubſtances are volatile; all the metals, gold not excepted, have been converted into vapour; but the earths, as far as we know, have never been volatilized, excepting only two, the diamond and aſbeſtos. Some phenomena attending the volatilization of the diamond give reaſon to ſuſpect that it is not a pure earthy ſubſtance. There is an appearance of inflammation; and it ſeems to be a compound, having an earthy matter for its baſis, and deriving its volatility from other matters. In general therefore, the earths have been found fixed in any degree of heat of which we have had experience; though there is no doubt a poſſibility, that heat might be raiſed to ſuch an intenſity as to volatilize the moſt fixed body in nature; but till the means of doing ſo ſhall be found out, the earths may be conſidered as abſolutely fixed.

The earths called *primitive* or *ſimple*, becauſe they cannot be decompoſed by any method hitherto known, were by Cronſtedt ſuppoſed to be nine; but later chemiſts have reduced them to five. Some reduce the number ſtill farther; but Mr Bergman informs us that theſe "reſt their opinions upon fanciful metamorphoſes unſupported by faithful experiments. As experiments teach us that there are five primitive earths, it is evident that the ſpecies ariſing from their mixture cannot exceed 24, viz. ten double, conſiſting of two earths; ſix triple, three quadruple, and the five primitive earths. Even all theſe different mixtures have not been found, though they probably do exiſt in nature. The natural compoſitions of acids with the earths, forming ſubſtances not ſoluble in 1000 times their weight of boiling water, and which may be called *ſaline earths*, are undoubtedly chemical combinations. The five primitive earths are, terra ponderoſa; calx or calcareous earth, capable of being reduced into quicklime; magneſia; argilla or argillaceous earth; and ſiliceous earths.

"But though we muſt conſider theſe as the moſt pure of all the earthy bodies, they are never found native in a ſtate of abſolute purity; nor indeed can they be made perfectly pure even by artificial means. Water and aerial acid unite readily with the four firſt; and when expelled by fire, a little of the matter of heat is added, until driven out by a more powerful attraction. But in this ſtate they poſſeſs a degree of purity not to be attained by any other known method. Therefore it is neceſſary to examine them when ſufficiently burnt, in order to diſtinguiſh better what properties depend upon adhering heterogeneous matters."

Our author at firſt added the earth of gems to the five claſſes already mentioned; but he found afterwards that all kinds of gems are compounded of ſome of the five kinds already mentioned, particularly of the argillaceous kind, inſomuch that they may be ſaid almoſt entirely to belong to this claſs. Still, however, the earth of diamonds ſeems to poſſeſs properties eſſentially diſtinct from the five already mentioned, and therefore may not unjuſtly be reckoned a ſixth claſs, though its characters have as yet been but very imperfectly examined.

I. *Terra Ponderoſa*. This was diſcovered in Sweden about the year 1774, and is found in ſeveral different forms.

1. Combined with aerial acid, called by Dr Withering *terra ponderoſa aerata*. This ſubſtance has been

met

met with in England; and an account of it, with Dr Withering's analyſis, is given under the article CHEMISTRY.

2. The ſpar-like gypſum, marmor metallicum, lapis bononienſis, phoſphorus nativus, baro-ſelenite, &c. is of very conſiderable ſpecific gravity, approaching to that of tin or iron; on which account it has been ſuppoſed to contain ſomething metallic. But no experiments hitherto made have evinced the exiſtence of any metal in it, excepting a few traces of iron, which are to be met with in all the gypſa. It is met with of two kinds, ſemitranſparent and opaque; the latter being either of a white or reddiſh colour. The ſpecific gravity is about 4,500, water being accounted 1000. It contains about 84 parts of ponderous earth, 13 of the moſt concentrated vitriolic acid, and three of water. The method of preparing the phoſphorus from this ſubſtance is mentioned under the article CHEMISTRY; but Cronſtedt obſerves, that the phoſphoreſcent quality of theſe ſtones is different from that of the ſparry fluors and limeſtones, which is only produced by their being ſlowly heated, and ſeems to ariſe from a phlogiſton which is deſtroyed by a glowing heat. M. Scheffer, in the Stockholm Memoirs for 1753, relates ſome experiments on a ſtone of this kind from China, which ſhow that it is exactly the ſame with the *petunſe* of that country, an ingredient in their porcelain manufactories. This ſtone does not burn into plaſter as gypſum does, and is infuſible by itſelf. It frequently contains calcareous earth, and ſometimes is met with in the ores of metals, and it likewiſe forms the baſis of ſome petrifications. Sometimes it contains one or two parts of iron in the hundred.

3. The marmor metallicum druſicum, or ponderous druſen ſpar, is found in the lead-mines at Alſtonmoor in Cumberland, regularly cryſtallized in the form of alum, ſolid, and ſemitranſparent. M. Magellan ſays that he was ſhowed ſome fine ſpecimens of this mineral by a Mr Thomſon, who informed him that "it ſeems to affect the peculiarity of having its cryſtals laminated, as radiating from a centre; but that this radiation ſeldom amounts to a whole circle. The corners of theſe flat cryſtals are truncated like thoſe of alum, and thicker on one ſide than the other of the parallelogram, in ſuch a manner as to fit one another in the kind of arched vault which they form together, and have ſome ſmall ones adhering to their ſides like druſen ſpars, having internal angles, as the *macles* of the French, or the cruciform cryſtallizations." The ſpecific gravity of theſe cryſtals were found by Mr Nicholſon, with an inſtrument of his own invention, to be to water as 44,745 to 10,000. This ſpecies of cryſtals is found in Auvergne in France, and has been deſcribed by Mr Bayen, who ſuppoſed its baſis to be calcareous. It was extremely refractory, and the ſurface of its cryſtals covered with ferruginous ochre. A variety of this is found jagged like cocks combs. This is met with in clifts and fiſſures, accreted on the ſurfaces of balls of the ſame ſubſtance. In Derbyſhire this ſubſtance is called *cauk* or *calk*. M. Magellan was ſhowed ſome ſpecimens of it by Mr Whitehurſt, which had not only convex but flat ſurfaces. Thoſe of the upper aggregated parts were rather like the edges of very thin flattiſh lenſes put together, than like cocks combs. Varieties of it are alſo found of white and reddiſh colours. It is likewiſe met with of a fibrous texture in the form of zeolite or aſbeſtos in filaments. M. Monnet is of opinion that theſe ſpars ſometimes contain phlogiſton, having obſerved that they become a liver of ſulphur in a ſtrong heat; but Mr Woulfe is of opinion that this gentleman was deceived by charcoal falling into his crucible.

4. The lapis hepaticus, or leberſtein of the Germans and Swedes. Some ſpecimens of this ſtone conſtantly ſmell like liver of ſulphur, but others only when rubbed. It does not efferveſce with acids, and according to M. Magellan is a medium between the gypſum and fetid calcareous ſtones with which it has generally been confounded; but it will not yield any lime, though the latter are more fit for the purpoſe than any other. Mr Kirwan informs us that this ſtone is generally compact, but not hard enough to ſtrike fire; its texture is either equable or laminar, ſcaly or ſparry; and it takes a poliſh like alabaſter, does not efferveſce with acids, and when calcined is partially reduced to a kind of plaſter of Paris. According to the analyſis of this ſtone given us by Profeſſor Bergman, 100 parts of it contain 33 of baro-ſelenite, 38 of ſiliceous earth, 22 of alum, ſeven of gypſum, and five of mineral oil. Cronſtedt denies that theſe ſtones contain any volatile alkali, though his aſſertion is contradicted by Wallerius, who affirms, that a volatile alkali certainly exiſts in them, and may be diſcovered by a chemical analyſis. "The method which nature takes to combine the ingredients of the lapis hepaticus (ſays Cronſtedt), may be perhaps the ſame as when a limeſtone is laid in an heap of mundic while it is roaſting; becauſe there the ſulphur unites itſelf with the limeſtone, whereby the latter acquires the ſmell of liver of ſulphur, inſtead of which the vitriolic acid alone enters the compoſition of gypſum. How the ſulphur combines itſelf may likewiſe be obſerved in the ſlate-balls or kernels from the Andrarum alum mines to be afterwards mentioned, where it ſometimes combines with a martial earth with which this ſlate abounds, and with it forms pyrites within the very ſlate balls. The fetid or ſwine ſtones, as well as the liver-ſtones, are, with regard to the ſtructure of their parts, ſubject to the ſame varieties with the other kinds of limeſtones." This kind of ſtone is found, 1. Scaly, of which there are two varieties; one having coarſe ſcales, the other of a whitiſh yellow colour. 2. With fine glittering ſcales. This is met with of a black colour at Andrarum in Sweden, in the alum ſlate above mentioned. Bergman ſays that this kind conſiſts of a ponderous earth combined with vitriolic acid, mixed with a rock oil. and with the calcareous, argillaceous, and ſiliceous earths. He adds, that by a chemical analyſis one of theſe kernels gave 29 parts of cauſtic ponderous earth, 33 of ſiliceous, almoſt 5 of the argillaceous, and 3.7 of lime, beſides the water and vitriolic acid which entered its compoſition.

II. *Calcareous Earths*, when freed from impurities as far as poſſible, have the following properties. 1. They become friable when burnt in the fire. 2. They more readily fall into powder by being thrown into water, or having it thrown upon them after calcination. 3. They cannot be melted by themſelves into glaſs in cloſe veſſels. 4. They augment the cauſticity of alkaline ſalts by being mixed with them after burning. 5. They exhibit different phenomena in combination with the different acids. With the vitriolic they precipitate in the form of a gypſeous earth capable of ſhooting, by proper management, into ſelenitic cryſtals. With marine acid they form a deliqueſcent maſs called *fixed ſal ammoniac*, and which forms a kind of phoſphorus. With nitrous acid they combine into a glutinous deliqueſcent maſs, from which the acid may be partly driven off by fire; in which operation part of the earth itſelf is volatilized, and which, in a certain ſtate of calcination, produces Baldwin's phoſphorus. With the fluor acid they regenerate the ſpar from which this acid was procured. With phoſphoric acid they are ſaid to regenerate the earth of bones; though the experiments by which this is ſaid to be proved are, as we have often had occaſion to obſerve, by no means concluſive. With the acid of vinegar they cryſtallize into neutral ſalts, which do not deliqueſce in the air. 6. With borax they readily melt into a kind of glaſs which takes impreſſions in a degree of heat below ignition. 7. With the microcoſmic acid they likewiſe melt into glaſs with efferveſcence; a circumſtance likewiſe obſervable when borax is made uſe of; and both theſe glaſſes are quite colourleſs and tranſparent while hot, but become opaque as ſoon as they cool; but if the bead is thrown whilſt hot into melted tallow, or even into warm water or any other hot liquor, it preſerves its tranſparency. 8. With fluſs-ſpat they melt more readily than with any other into a kind of ſlag, by which crucibles are corroded. This, however, according to M. Magellan, is entirely to be attributed to the ſolvents. 9. In certain caſes they are likewiſe found capable of reducing ſome metallic calces, as thoſe of lead and biſmuth; ſometimes alſo thoſe of iron and copper are affected, though in a leſs degree. But on this Mr Kirwan remarks, that ſuch reductions take place only when the earth is combined with aerial acid; and that though calces of lead are in ſome meaſure reduced by chalk, they are not in the leaſt affected by lime; which evidently proves that they receive phlogiſton from fixed air, which is a compound of phlogiſton and dephlogiſticated air. 10. In this laſt inſtance, as well as in ſome others, they reſemble alkaline ſalts; whence they frequently take the title of alkaline earths. Mr Bergman obſerves, that as calcareous earth united to the aerial acid is found native, very little trouble is neceſſary to procure it in a ſtate of purity. For this purpoſe nothing more is requiſite than to boil ſelected pieces of chalk repeatedly in pure water, which diſſolves any calcined earth or *magneſia ſalita* that may be contained in it; after which operation it has no heterogeneous matter but what mechanically adheres to it, the quantity of which is generally extremely ſmall; and if we likewiſe deſire to have it abſolutely free of this, we muſt diſſolve it in vinegar, precipitate it with mild volatile alkali, and dry it after carefully waſhing the precipitate. The ſpecific gravity of the precipitate thus carefully waſhed and dried is about 2.720. An hundred parts of it contain about 34 of aerial acid, 11 of water, and 54 of pure earth. Acids unite with it with efferveſcence, and the mixture produces heat. When burnt it loſes $\frac{45}{100}$ of its weight; and in this ſtate diſſolves in 700 times its weight of water, producing heat at the ſame time. If acids are poured upon it when in a calcined ſtate, a great degree of heat is produced; inſomuch that unleſs part of it be abſtracted by previouſly mixing the earth with water, the mixture will be made to boil. The pouring of water upon calcined earth of this kind likewiſe expels the atmoſpheric air from its pores. In this caſe, if nitrous or muriatic acid be added, no efferveſcence will enſue; the ſolution will proceed ſlowly, but the ſaturation becomes at length as perfect as if the earth had not been calcined. By this burnt earth the acid is expelled from ſal ammoniac, ſulphur is diſſolved, and other remarkable effects performed, of which an account is given under the articles CHEMISTRY, DYEING, CEMENT, MORTAR, &c.

The calcareous earth, according to Cronſtedt, is common to all the three kingdoms of nature; exiſting in the ſhells and bones of animals, the aſhes of vegetables; and conſequently, ſays he, it muſt have exiſted before any living or vegetable ſubſtance, and is no doubt diſtributed throughout the earth in a quantity proportioned to its general uſe.

The forms in which calcareous earth is ever met with are the ſhells of animals, chalk, limeſtone, and marble; for an account of which ſee theſe different articles. Its uſes as a manure, and in building, are detailed under the articles CEMENT and AGRICULTURE. Meſſrs Sage, Rome de L'Iſle, &c. have ſuppoſed the exiſtence of a kind of earth called *abſorbent*, diſtinct from the calcareous; but M. Monnet has ſhown this to be truly calcareous.

III. *Magneſia*, called alſo *terra muriatica*, or magneſia alba. The nature and properties of this earth are deſcribed under the article MAGNESIA. It is found,

1. Combined with the vitriolic acid in the form of a bitter ſalt called Epſom or Sedlitz ſalt. This is found in great plenty in the liquor which remains after the cryſtallization of ſea-ſalt.

2. With the marine acid; in which caſe it forms a ſalt likewiſe cryſtallizable, but of a very hot burning taſte, and emitting vapours of ſpirit of ſalt by diſtillation. This is known by the name of *magneſia ſalita*, and is likewiſe found in plenty in the liquor above mentioned.

3. It is contained alſo in freſh waters, where it is diſſolved by the aerial acid.

4. Combined with the ſiliceous earth. This is commonly unctuous to the touch, and of different degrees of hardneſs, incapable of being diffuſed in water, and growing hard and very refractory in the fire. It is met with in various parts of the world, particularly in the eaſt, and is the ſubſtance of which the large Turky tobacco-pipes are made. It is alſo called *French chalk*, and is met with in England about the Land's End of Cornwall, of a yellow colour, or red and white like Caſtile ſoap. It conſiſts, according to Mr Wiegleb, of equal parts of magneſia and ſiliceous earth. A mixture of this with calcareous earth and iron is found near Thionville in the French part of Luxembourg. It is of a blue colour, and contains the greateſt proportion of calcareous earth, with ſome clay and petrified matters. Another of an olive colour is found in the ſame place; but has no argillaceous earth in it, though they

both

both look like clay, and the laſt is uſed in pottery. A mixture of this earth with clay, talc, and iron, is found in Sileſia. It is of a greeniſh yellow, is of a looſe form and greaſy feel. According to Mr Margraaff it contains one-third of magneſia.

5. In ſteatites or ſoap-rock. See STEATITES.

6. In ſerpentine ſtone. See SERPENTINE.

IV. *Argillaceous Earths*. See CLAY.

V. *Siliceous Earths*. See CHEMISTRY, FLINT, GEMS, DIAMOND, EMERALD, SAPPHIRE, &c. alſo CHEMISTRY, n° 829, 847, 1074, and 1076.

EARTH, in aſtronomy and geography, one of the primary planets; being this terraqueous globe which we inhabit.

1
Different opinions reſpecting the coſmogony.

The coſmogony, or knowledge of the original formation of the earth, the materials of which it was compoſed, and by what means they were diſpoſed in the order in which we ſee them at preſent, is a ſubject which, though perhaps above the reach of human ſagacity, has exerciſed the wit of philoſophers in all ages. To recount the opinions of all the eminent philoſophers of antiquity upon this ſubject would be very tedious: it may therefore ſuffice to obſerve, that, ever ſince the ſubject began to be canvaſſed, the opinions of thoſe who have treated it may be divided into two claſſes. 1. Thoſe who believed the earth and whole viſible ſyſtem of nature to be the Deity himſelf, or connected with him in the ſame manner that a human body is with its ſoul. 2. Thoſe who believed the materials of it to have been eternal, but diſtinct from the Deity, and put into the preſent order by ſome power either inherent in themſelves or belonging to the Deity. Of the former opinion were Zenophanes the founder of the *eleatic* ſect, Strato of Lampſacus, the Peripatetics, &c.

The ſecond opinion, namely, that the ſubſtance of the earth or univerſe (for it is impoſſible to ſpeak of the one without the other) was eternal, though not the form, was moſt generally held among the ancients. From that eſtabliſhed axiom, that "nothing can be produced from nothing," they concluded that creation was an impoſſibility; but at the ſame time they thought they had good reaſon to believe the world had not been always in its preſent form. They who held this opinion may again be divided into two claſſes: firſt, thoſe who endeavoured to account for the generation of the world, or its reduction into the preſent form, by principles merely mechanical, without having recourſe to any aſſiſtance from divine power; and, ſecondly, thoſe who introduced an intelligent mind as the author and diſpoſer of all things. To the firſt of theſe claſſes belonged the coſmogony of the Babylonians, Phœnicians, and Egyptians; the particulars of which are too abſurd to deſerve notice. Of the ſame opinion alſo were moſt of the poets; the philoſophers Thales, Anaximander, Anaximenes, Anaxagoras, &c. The latter attempted to reform the philoſophy of his maſter Anaximenes by introducing an intelligent principle into the world diſtinct from matter; thus making his intelligent principle, or God, the ſoul of the world. Diogenes of Apollonia ſuppoſed air, which he made the firſt principle of all things, to be endued with reaſon: His manner of philoſophiſing differed very little from that of Des Cartes. "All things (ſays he) being in motion, ſome became condenſed and others rarefied. In thoſe places where condenſation prevailed, a whirling motion or vortex was formed; which by its revolution drew in the reſt, and the lighter parts flying upwards formed the ſun."

Syſte
Dem
and l
lus.

The moſt remarkable of the atheiſtic ſyſtems, however, was the atomic one, ſuppoſed to have been invented by Democritus; though Laertius attributes it to Leucippus, and ſome make it much older. According to this ſyſtem, the firſt principles of all things were an infinite multitude of atoms, or indiviſible particles of different ſizes and figures; which, moving fortuitouſly, or without deſign, from all eternity, in infinite ſpace, and encountering with one another, became variouſly entangled during their conflict. This firſt produced a confuſed chaos of all kinds of particles; which afterwards, by continual agitation, ſtriking and repelling each other, diſpoſed themſelves into a vortex or vortices, where, after innumerable revolutions and motions in all poſſible directions, they at laſt ſettled into their preſent order.

The hypotheſis of Democritus agrees in the main with that of Epicurus as repreſented by Lucretius; excepting that no mention is made of thoſe vortices, which yet were an eſſential part of the former. To the two properties of magnitude and figure which Democritus attributed to his atoms, Epicurus added a third, namely, weight; and, without this, he did not imagine they could move at all The ſyſtem of Democritus neceſſarily introduced abſolute fatal neceſſity; which Epicurus not chooſing to agree to, he invented a third motion of the atoms, unknown to thoſe who had gone before him. His predeceſſors allowed them to have a perpendicular and reflexive motion: but Epicurus, though he allowed theſe motions to be abſolutely neceſſary and unavoidable, aſſerted that the atoms could alſo of themſelves decline from the right line: and from this declination of the atoms he explained the free will of man.—The moſt material difference between the two ſyſtems, however, was, that Epicurus admitted no principle but the atoms themſelves; whereas Democritus believed them to be animated.

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Of thoſe who held two diſtinct and coeternal principles, *viz.* God and Matter, we ſhall only take notice of the opinions of Pythagoras, Plato, and Ariſtotle, as being the moſt remarkable.

Pythagoras is ſaid to have aſſerted two ſubſtantial ſelf-exiſtent principles: a *monad*, or unity; and a *dyad*, or duality. The meaning of theſe terms is now ſomewhat uncertain. Some think, that by the monad he meant the Deity, and by the dyad matter. Others think, that the Pythagoric monads were atoms. The dyad is ſometimes thought to ſignify a demon or evil principle; but Porphyry's interpretation, which ſeems the moſt probable, is as follows. The cauſe, ſays he, of that ſympathy, harmony, and agreement which is in things, and of the conſervation of the whole, which is always the ſame and like itſelf, was by Pythagoras called *unity*; that unity which is in the things themſelves being but a participation of the firſt cauſe: but the reaſon of difference, inequality, and conſtant irregularity in things, was by him called a *dyad*. This philoſopher held *numbers* to be the principles

ciples of all things; and from them he accounted for the production of the world in the following manner. He ſuppoſed that the monad and dyad were the two ſources of numbers, from whence proceeded points; from points, lines; from lines, plane figures; from planes, ſolids: from ſolids, ſenſible bodies. The elements of ſenſible bodies are four; but, beſides theſe, there was a fifth (never yet diſcovered). The four elements which manifeſt themſelves to our ſenſes are, fire, air, earth, and water. Theſe are in a perpetual change, and from them the world was formed; which is animated, intelligent, and ſpherical; containing, in the midſt of it, the earth, a globoſe and inhabited body. The world, he ſaid, began from fire and the fifth element; and that as there were five figures of ſolid bodies, called mathematical or regular, the earth was made of the cube, fire of the pyramid or tetrahedron, the air of the octahedron, water of the icoſahedron, and the ſphere of the univerſe of the dodecahedron.—This method of philoſophizing, which has no manner of foundation in nature, was adopted by Plato and Ariſtotle; and hence proceeded all the abſurdities concerning ideas, forms, qualities, &c. with which the Ariſtotelian philoſophy was loaded.

For a long time, however, the philoſophy of Ariſtotle prevailed, and the world was thought to be upheld by forms, qualities, and other unintelligible and imaginary beings.—At laſt the French philoſopher Des Cartes ſuperſeded the Ariſtotelian, by introducing the atomic or Democritic, and Epicurean philoſophy *. The Carteſian ſyſtem was quickly ſuperſeded by the Newtonian; which ſtill continues, though conſiderably different from what it was left by that great man.—His opinions, indeed, concerning the coſmogony ſeem to have been in a fluctuating ſtate; and hence he delivers himſelf in ſuch a manner, that he hath often incurred the charge of contradicting himſelf.—He maintained, for inſtance, that matter was infinitely diviſible; and the mathematical demonſtrations of this propoſition are well known. Notwithſtanding this, however, when he comes particularly to ſpeak of the original conſtruction of the world, he ſeems to retract this opinion, and adopt the atomic philoſophy. He tells us, that it ſeems probable, that in the beginning God formed matter in *ſolid, maſſy, impenetrable* particles, &c. †; and that of theſe particles, endowed with various powers of attraction and repulſion, the preſent ſyſtem of nature is formed. His primary laws of nature are only three in number, and very ſimple. The firſt is, that all matter has a tendency to continue in that ſtate in which it is once placed, whether of reſt or motion. If it is at reſt, for example, it will continue at reſt for ever, without beginning motion of itſelf; but if it is once ſet in motion by any cauſe whatever, it will for ever continue to move in a right line, until ſomething either ſtops it altogether, or forces it to move in another direction. 2. That the change of motion is always equivalent to the moving force employed to produce it, and in the direction of the right line in which it is impreſſed; that is, if a certain force produces a certain motion, double that force will produce double that motion, &c. 3. Reaction is always contrary and equal to action; or the actions of two bodies upon one another are always equal and contrary to one another.

From theſe three laws, together with the two contrary forces of attraction and repulſion, Sir Iſaac Newton and his followers have attempted to explain all the phenomena of nature. When they come to explain the nature of the attractive and repulſive forces, however, they are exceedingly embarraſſed. Sir Iſaac hath expreſſed himſelf in two different ways concerning them. In his Principia, he pretty poſitively determines them to be owing to a cauſe that is not material; and in his Queries, he ſuppoſes they may be effects of ſome ſubtile matter which he calls *ether*. This diſagreement with himſelf hath produced no ſmall diſagreement among his followers. One party, laying hold of his aſſertions in the Principia, determine the world to be upheld by *immaterial* powers; while the other, neglecting the Principia, and taking notice only of the Queries at the end of the Optics, ſtrenuouſly maintain, that attraction and repulſion are owing to the action of ſome exceedingly fine and ſubtile ether.—The firſt of theſe ſuppoſitions, it is argued, neceſſarily involves us in one of the following dilemmas. 1. If the attractive and repulſive forces are not material, they muſt either be occaſioned by ſpiritual beings, or they muſt be *qualities* of matter. If they are occaſioned by the action of immaterial beings, theſe beings muſt either be created or uncreated. If they are produced by the action of created beings, we run into the ſuppoſition of ſome of the ancient heathens, that the world is governed by demons or ſubordinate intelligences; and thus may make an eaſy tranſition to polytheiſm. If attraction and repulſion are the immediate action of the Deity himſelf, we run into the doctrine of making God the ſoul of the world.—This laſt hypotheſis hath been moſt ſtrenuouſly adopted by Mr Baxter in his treatiſe of the Immateriality of the human Soul. Mr Boſcovich, Mr Mitchel, and Dr Prieſtley, have likewiſe adopted the hypotheſis of immaterial powers to ſuch a degree, that, according to them, the whole world conſiſts of nothing elſe but *attractions* and *repulſions* ſurrounding *phyſical points* †. 2. If we ſuppoſe the attractive and repulſive powers to be only *properties, qualities*, or *laws*, impreſſed on matter by the Deity, we might as well have been contented with the occult qualities of Ariſtotle.—If attraction and repulſion are occaſioned by the action of mere matter, and all the powers in nature are only material, the charge is incurred of making nature direct itſelf in ſuch a manner, that there is no occaſion for the interpoſition, or even the exiſtence, of a Deity at all.

6
Diſagreement among his followers.

7
Mr Mitchel, Boſcovich, and Dr Prieſtley's opinions.

Thus we ſee, the Newtonian coſmogony muſt incline either to the Platonic and Ariſtotelian, or to the Atomic or Epicurean; according to the hypotheſis we lay down concerning the nature of attraction. Des Cartes's ſyſtem was plainly a revival of that of Democritus and Epicurus, with ſome corrections and improvements. It was farther improved and corrected by Mr Hutchinſon, who added to it the authority of Revelation. The created agents he choſe in his coſmogony were fire, light, and air. Theſe, we ſee, have indeed a very conſiderable ſhare in the operations of nature; but unleſs we explain the manner in which they operate, our knowledge is not at all increaſed, and we might as well have been contented with the Newtonian attraction and repulſion, or even the occult qualities of Ariſtotle. Attempts have indeed been made to ſolve the phenomena

8
Mr Hutchinſon's ſyſtem.

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† See *Coheſion*, n° 8.

phenomena of nature, from the action of theſe three agents, both by Hutchinſon himſelf and many of his followers.—Theſe attempts, however, have always proved unſucceſsful. Some phenomena indeed may be explained pretty plauſibly from the known action of theſe three; but when we come to ſpeak of what may be called the *nicer operations* of nature, ſuch as the growth of plants and animals, we are utterly at a loſs.

9
A deficiency of active principles in all the theories yet invented.

The manifeſt deficiency of active principles in all the theories of the earth that have yet been invented, hath occaſioned a conſtant ſearch after others which ſhould be able, by their ſuperior activity, to fill up the blank which neceſſarily remained in the ſyſtem.—Pythagoras, Plato, and Ariſtotle, being unable to account for the formation of the earth from their four elements, called in the aſſiſtance of a *fifth*, which was never yet diſcovered. Epicurus, finding the motions attributed to his atoms by Democritus to be inſufficient, had recourſe to an imaginary, and on his own principles *impoſſible*, declination of the atoms. Des Cartes, finding the atoms themſelves inſufficient, aſſerted that they were not atoms, but might be broken into ſmaller parts, and thus conſtitute matter of various degrees of ſubtility. The Newtonian philoſophers have found Des Cartes's ſyſtem inſufficient; but being greatly diſtreſſed in their attempts to ſolve all the phenomena of nature by mere attraction and repulſion, have been obliged to call in the action of *mind* to their aſſiſtance. The Hutchinſonians were hardly put to it in accounting for every thing by the action of fire, light, and air, when luckily the diſcoveries in electricity came to their aſſiſtance. It muſt be owned, that this fluid does indeed come in like a kind of fifth element, which in many caſes appears to be the animating principle of nature. For ſome time paſt, almoſt all the remarkable phenomena in nature have been explained by electricity, or the action of the electric fluid. But unleſs this action is explained, we are got no farther than we were before. To ſay that any thing is done by electricity, is not more intelligible than to ſay that it was done by attraction. If we explain an effect by a material cauſe, it ought to be done upon mechanical principles. We ought to be ſenſible how one part of matter acts upon another part in ſuch a manner as to produce the effect we deſire to explain. The electrical philoſophers, however, have not yet been able to inveſtigate the manner in which this ſubtile fluid operates; and hence the many diſcoveries in electricity have not contributed to throw that light on the theory of the earth, which perhaps they may do hereafter. With ſome philoſophers, however, the electric fluid itſelf, and indeed all the powers of nature, were in danger of being ſuperſeded by a principle, lately very little known, called the *phlogiſton*.—Thus, Mr Henly tells us[*], that Mr Clarke, an ingenious gentleman in Ireland, hath diſcovered all the different kinds of air produced from metals, &c. by Dr Prieſtley, to be only *phlogiſtic vapours* ariſing from theſe ſubſtances. Dr Prieſtley himſelf ſuppoſes, that the electric light is a modification of *phlogiſton*; and conſequently thinks it probable, that all light is a modification of the ſame. Fire or flame is thought to be a chemical combination of air with the phlogiſton; and phlogiſton is thought to give the elaſticity to air, and every other elaſtic fluid, &c. Another party, ſeemingly jealous of the powers of this new principle, have denied its exiſtence altogether, and in its ſtead introduced another equally inſufficient, called the *oxygenous principle*. Others have reduced all nature to the two principles called *principium ſorbile* and *principium proprium*. All theſe, however, are ſhown, in other parts of this work, to be mere inactive ſubſtances; the phlogiſton, common charcoal; the oxygenous principle, water deprived of the quantity of phlogiſton it uſually contains; the principium ſorbile, the ſame; and the principium proprium, a name for the particular modification of the *atoms*, or what we pleaſe to call the inviſible eſſence of matter which diſtinguiſhes one body from another, and which muſt be for ever unknown to all human creatures.—Be this as it will, the late diſcoveries in electricity have tended very much to change the form of the Newtonian philoſophy, and to introduce that *materialiſm* into our theories of the natural phenomena which is by ſome people ſo much complained of.

From this general hiſtory of the different agents which philoſophers have choſen to account for the original formation of the earth, and for its preſervation in the preſent form, it appears, that ſcarce any advance in true knowledge hath yet been made. All the agents have been prodigiouſly defective; electricity itſelf, as far as yet known, not excepted. But before we enter into a particular conſideration of thoſe theories which ſeem moſt worthy of notice, it will be neceſſary to point out the principal difficulties which ſtand in the way of one who attempts to give a complete theory of the earth.

1. The earth, although pretty much of a ſpherical figure, is not completely ſo; but protuberates conſiderably about the equatorial parts, and is proportionably flattened at the poles, as is undeniably proved by the obſervations of modern mathematicians[†]. The queſtion here is, Why the natural cauſe which gave the earth ſo much of a ſpherical figure, did not make it a complete and exact ſphere?

2. The terraqueous globe conſiſts of a vaſt quantity of water as well as dry land. In many places, ſuch as the Iſthmus of Darien, a narrow neck of land is interpoſed betwixt two vaſt oceans. Theſe beat upon it on either ſide with vaſt force; yet the Iſthmus is never broke down nor diminiſhed. The caſe is the ſame with the Iſthmus of Suez which joins Aſia and Africa, and with that which joins the Morea or ancient Peloponneſus to the continent. The difficulty is, By what natural power or law are theſe narrow necks of land preſerved amidſt the waters which threaten them on both ſides with deſtruction?

3. The ſurface of the earth is by no means ſmooth and equal; but in ſome places raiſed into enormous ridges of mountains, and in others ſunk down in ſuch a manner as to form deep valleys. Theſe mountains, though they have been expoſed to all the injuries of the weather for many thouſand years, exhibit no ſigns of decay. They ſtill continue of the ſame ſize as before, though vaſt quantities of earth are frequently waſhed down from them by the rains, which, together with the force of gravity, tending to level and bring them on an equality with the plains on which they ſtand, we might reaſonably think, ought by this time to have rendered them ſmaller than before. It muſt therefore

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[*] Phil. Trans. Vol. 67.

[†] See

therefore be inquired into, By what natural cauſe the mountains were originally formed, and how they come to preſerve their ſize without any remarkable diminution?

4. The internal parts of the earth are ſtill more wonderful than the external. The utmoſt induſtry of man, indeed, can penetrate but a little way into it. As far as we can reach, however, it is found to be compoſed of diſſimilar ſtrata lying one upon another, not commonly in a horizontal direction, but inclined to the horizon at different angles. Theſe ſtrata ſeem not to be diſpoſed either according to the laws of gravity or according to their denſity, but as it were by chance. Beſides, in the internal parts of the earth are vaſt chaſms and vacuities. By what means were theſe ſtrata originally depoſited, the fiſſures and chaſms made, &c.?

5. In many places of the earth, both on the ſurface and at great depths under it, vaſt quantities of marine productions, ſuch as ſhells, &c. are to be met with. Sometimes theſe ſhells are found in the midſt of ſolid rocks of marble and limeſtone. In the very heart of the hardeſt ſtones, alſo, ſmall vegetable ſubſtances, as leaves, &c. are ſometimes to be found. The queſtion is, By what means were they brought thither?

Theſe are ſome of the moſt ſtriking difficulties which preſent themſelves to one who undertakes to write a natural hiſtory or theory of the earth. The moſt remarkable attempts to produce a theory of this kind are the following.

2 rnet's .

I. According to Dr Burnet, the earth was originally a fluid maſs, or chaos, compoſed of various ſubſtances differing both in denſity and figure. Thoſe which were moſt heavy, ſunk to the centre, and formed there a hard ſolid body: thoſe which were ſpecifically lighter remained next above; and the waters, which were lighteſt of all, covered the earth all round. The air, and other ethereal fluids, which are ſtill lighter than water, floated above it, and ſurrounded the globe alſo. Betweeen the waters, however, and the circumambient air, was formed a coat of oily and unctuous matter lighter than water. The air at firſt was very impure, and muſt neceſſarily have carried up with it many of thoſe earthy particles with which it was once blended: however, it ſoon began to purify itſelf, and depoſit thoſe particles upon the oily cruſt above mentioned; which, ſoon uniting together, the earth and oil became the cruſt of vegetable earth, with which the whole globe is now covered. His account of the deſtruction of the primeval world by the flood, by the falling down of the ſhell of earth into the waters of the abyſs, is given under the article Deluge. It only remains then to give his account of the manner in which he relieves the earth from this univerſal deſtruction; and this he does as follows. Theſe great maſſes of earth, ſays he, falling into the abyſs, drew down with them vaſt quantities alſo of air; and by daſhing againſt each other, and breaking into ſmall parts by the repeated violence of the ſhock, they at length left between them large cavities filled with nothing but air. Theſe cavities naturally offered a bed to receive the influent waters; and in proportion as they filled, the face of the earth became once more viſible. The higher parts of its broken ſurface, now become the tops of mountains, were the firſt that appeared; the plains ſoon after came forward; and at length the whole globe was delivered from the waters, except the places in the loweſt ſituations; ſo that the ocean and ſeas are ſtill a part of the ancient abyſs, that have had no place to which they might return. Iſlands and rocks are fragments of the earth's former cruſt; continents are larger maſſes of its broken ſubſtance; and all the inequalities that are to be found on the ſurface of the preſent earth are effects of the confuſion into which both earth and water were at that time thrown.

13 Dr Woodward's.

II. Dr Woodward begins with aſſerting, that all terrene ſubſtances are diſpoſed in beds of various natures, lying horizontally one over the other, ſomewhat like the coats of an onion: that they are replete with ſhells, and other productions of the ſea; theſe ſhells being found in the deepeſt cavities, and on the tops of the higheſt mountains. From theſe obſervations, which are warranted by experience, he proceeds to obſerve, that theſe ſhells and extraneous foſſils are not productions of the earth, but are all actual remains of thoſe animals which they are known to reſemble; that all the ſtrata or beds of the earth lie under each other in the order of their ſpecific gravity, and that they are diſpoſed as if they had been left there by ſubſiding waters. All this he very confidently affirms, tho' daily experience contradicts him in ſome of them; particularly, we often find layers of ſtone over the lighteſt ſoils, and the ſofteſt earth under the hardeſt bodies. However, having taken it for granted, that all the layers of the earth are found in the order of their ſpecific gravity, the lighteſt at top, and the heavieſt next the centre, he conſequently aſſerts, that all the ſubſtances of which the earth is compoſed were originally in a ſtate of diſſolution. This diſſolution he ſuppoſes to have taken place at the flood: but being aware of an objection, that the ſhells, &c. ſuppoſed to have been depoſited at the flood are not diſſolved, he exempts them from the ſolvent power of the waters, and endeavours to ſhow that they have a ſtronger coheſion than minerals; and that, while even the hardeſt rocks are diſſolved, bones and ſhells may remain entire.

14 Mr Whiſton's

III. Mr Whiſton ſuppoſes the earth to have been originally a comet; and conſiders the Moſaic account of the creation as commencing at the time when the Creator placed this comet in a more regular manner, and made it a planet in the ſolar ſyſtem. Before that time, he ſuppoſes it to have been a globe without beauty or proportion; a world in diſorder, ſubject to all the viciſſitudes which comets endure; which, according to the preſent ſyſtem of philoſophy, muſt be alternately expoſed to the extremes of heat and cold. Theſe alternations of heat and cold, continually melting and freezing the ſurface of the earth, he ſuppoſes to have produced, to a certain depth, a chaos reſembling that deſcribed by the poets, ſurrounding the ſolid contents of the earth, which ſtill continued unchanged in the midſt; making a great burning globe of more than 2000 leagues in diameter. This ſurrounding chaos, however, was far from being ſolid: he reſembles it to a denſe, though fluid atmoſphere, compoſed of ſubſtances mingled, agitated, and ſhocked againſt each other; and in this diſorder he ſuppoſes the earth to have been juſt at the eve of the Moſaic creation. But upon its orbit being then changed, when it was more regularly wheeled round the ſun, every thing took its proper place, every part of the ſurrounding fluid then fell

fell into a certain ſituation according as it was light or heavy. The middle or central part, which always remained unchanged, ſtill continued ſo; retaining a part of that heat which it received in its primeval approaches towards the ſun; which heat he calculates may continue about 6000 years. Next to this fell the heavier parts of the chaotic atmoſphere, which ſerve to ſuſtain the lighter: but as in deſcending they could not entirely be ſeparated from many watery parts, with which they were intimately mixed, they drew down theſe alſo along with them; and theſe could not mount again after the ſurface of the earth was conſolidated: they therefore ſurrounded the heavy firſt-deſcending parts in the ſame manner as theſe ſurrounded the central globe. Thus the entire body of the earth is compoſed next the centre of a great burning globe: next this is placed an heavy terrene ſubſtance that encompaſſes it; round which is circumfuſed a body of water. Upon this body of water is placed the cruſt of earth on which we inhabit: ſo that, according to Mr Whiſton, the globe is compoſed of a number of coats or ſhells, one within the other, all of different denſities. The body of the earth being thus formed, the air, which is the lighteſt ſubſtance of all, ſurrounded its ſurface; and the beams of the ſun darting through, produced the light, which, we are told by Moſes, firſt obeyed the divine command.

The whole economy of the creation being thus adjuſted, it only remained to account for the riſings and depreſſions on the ſurface of the earth, with the other ſeeming irregularities of its preſent appearance. The hills and valleys are by him conſidered as formed by their preſſing upon the internal fluid which ſuſtains the external ſhell of earth, with greater or leſs weight: thoſe parts of the earth which are heavieſt ſink the loweſt into the ſubjacent fluid, and thus become valleys: thoſe that are lighteſt riſe higher upon the earth's ſurface, and are called *mountains*.

Such was the face of nature before the deluge: the earth was then more fertile and populous than it is at preſent; the life of men and animals was extended to ten times it preſent duration; and all theſe advantages aroſe from the ſuperior heat of the central globe, which has ever ſince been cooling. As its heat was then in its full power, the genial principle was alſo much greater than at preſent; vegetation and animal increaſe were carried on with more vigour; and all nature ſeemed teeming with the ſeeds of life. But as theſe advantages were productive only of moral evil, it was found neceſſary to deſtroy all living creatures by a flood; and in what manner this puniſhment was accompliſhed, according to Mr Whiſton, is particularly taken notice of under the article Deluge.

15
Mr Buffon's theory.

IV. M. Buffon's theory differs very widely from the foregoing. He begins with attempting to prove, that this world which we inhabit is no more than the ruins of a world. "The ſurface of this immenſe globe (ſays he) exhibits to our obſervation, heights, depths, plains, ſeas, marſhes, rivers, caverns, gulfs, volcanoes; and on a curſory view, we can diſcover in the diſpoſition of theſe objects neither order nor regularity. If we penetrate into the bowels of the earth, we find metals, minerals, ſtones, bitumens, ſands, earths, waters, and matter of every kind, placed as it were by mere accident, and without any apparent deſign. Upon a nearer and more attentive inſpection, we diſcover ſunk mountains, caverns filled up, ſhattered rocks, whole countries ſwallowed up, new iſlands emerged from the ocean, heavy ſubſtances placed above light ones, hard bodies incloſed within ſoft bodies: in a word, we find matter in every form, dry and humid, warm and cold, ſolid and brittle, blended in a chaos of confuſion, which can be compared to nothing but a heap of rubbiſh, or the ruins of a world."

When taking a particular ſurvey of the external ſurface of the globe, he begins with the ocean, and the motion communicated to it by the influence of the ſun and moon which produces the tides.—"In examining the bottom of the ſea (ſays he), we perceive it to be equally irregular as the ſurface of the dry land. We diſcover hills and valleys, plains and hollows, rocks and earths of every kind; we diſcover likewiſe, that iſlands are nothing but the ſummits of vaſt mountains, whoſe foundations are buried in the ocean. We find other mountains whoſe tops are nearly on a level with the ſurface of the water; and rapid currents which run contrary to the general movement. Theſe currents ſometimes run in the ſame direction; at other times their motion is retrograde; but they never exceed their natural limits, which ſeem to be as immutable as thoſe which bound the efforts of land-rivers. On one hand we meet with tempeſtuous regions, where the winds blow with irreſiſtible fury; where the heavens and the ocean, equally convulſed, are mixed and confounded in the general ſhock; violent inteſtine motions, tumultuous ſwellings, water-ſpouts, and ſtrange agitations produced by volcanoes, whoſe mouths, tho' many fathoms below the ſurface, vomit forth torrents of fire; and puſh, even to the clouds, a thick vapour, compoſed of water, ſulphur, and bitumen; and dreadful gulphs or whirlpools, which ſeem to attract veſſels for no other purpoſe than to ſwallow them up. On the other hand we diſcover vaſt regions of an oppoſite nature, always ſmooth and calm, but equally dangerous to the mariner. To conclude, directing our eyes toward the ſouthern or northern extremities of the globe, we diſcover huge maſſes of ice, which, detaching themſelves from the polar regions, advance, like floating mountains, to the temperate climates, where they diſſolve and vaniſh from our view. The bottom of the ocean and the ſhelving ſides of rocks produce plentiful crops of plants of many different ſpecies: its ſoil is compoſed of ſand, gravel, rocks, and ſhells; in ſome places it is a fine clay, in others a compact earth: and in general, the bottom of the ſea has an exact reſemblance to the dry land which we inhabit.

"Let us next take a view of the dry land. Upon an attentive obſervation of this, we will find, that the great chains of mountains lie nearer the equator than the poles; that in the old continent their direction is more from eaſt to weſt than from ſouth to north; and that, on the contrary, in the new continent they extend more from north to ſouth than from eaſt to weſt. But what is ſtill more remarkable, the figure and direction of theſe mountains, which have a moſt irregular appearance, correſpond ſo wonderfully, that the prominent angles of one mountain are conſtantly oppoſite to the concave angles of the neighbouring mountain, and of equal dimenſions, whether they be ſeparated by an extenſive plain or a ſmall valley. I have further remarked, that oppoſite hills are always nearly of the ſame height; and that mountains generally occupy the middle of continents, iſlands, and promontories, dividing them by their greateſt lengths. I have likewiſe traced the courſes of the principal rivers, and find that their direction is nearly perpendicular to the ſea-coaſts into which they empty themſelves; and that during the greateſt part of their courſes they follow the direction of the mountains from which they derive their origin. The ſea-coaſts are generally bordered with rocks of marble and other hard ſtones; or rather with earth and ſand accumulated by the waters of the ſea, or brought down and depoſited by rivers. In oppoſite coaſts, ſeparated only by ſmall arms of the ſea, the different ſtrata or beds of earth are of the ſame materials. I find that volcanoes never exiſt but in very high mountains; that a great number of them are entirely extinguiſhed; that ſome are connected to others by ſubterranean paſſages, and their eruptions not unfrequently happen at the ſame time. There are ſimilar communications between certain lakes and ſeas. Some rivers ſuddenly diſappear, and ſeem to precipitate themſelves into the bowels of the earth. We likewiſe find certain mediterranean or inland ſeas, that conſtantly receive from many and great rivers prodigious quantities of water, without any augmentation of their bounds; probably diſcharging by ſubterraneous paſſages all thoſe extraneous ſupplies. It is likewiſe eaſy to diſtinguiſh lands which have been long inhabited, from thoſe new countries where the earth appears in a rude ſtate, where the rivers are full of cataracts, where the land is nearly overflowed with water or burnt up with drought, and where every place capable of producing trees is totally covered with wood.

"Proceeding in our examination, we diſcover that the upper ſtratum of the earth is univerſally the ſame ſubſtance: that this ſubſtance, from which all animals and vegetables derive their growth and nouriſhment, is nothing but a compoſition of the decayed parts of animal and vegetable bodies, reduced into ſuch ſmall particles that their former organic ſtate is not diſtinguiſhable. Penetrating a little deeper, we find the real earth, beds of ſand, limeſtone, clay, ſhells, marble, gravel, chalk, &c. Theſe beds are always parallel to each other, and of the ſame thickneſs throughout their whole extent. In neighbouring hills, beds or ſtrata of the ſame materials are uniformly found at the ſame levels, though the hills be ſeparated by large and deep valleys. Strata of every kind, even of the moſt ſolid rocks, are uniformly divided by perpendicular fiſſures. Shells, ſkeletons of fiſhes, marine plants, &c. are often found in the bowels of the earth, and on the tops of mountains, even at the greateſt diſtances from the ſea. Theſe ſhells, fiſhes, and plants, are exactly ſimilar to thoſe which exiſt in the ocean. Petrified ſhells are to be met with almoſt every where in prodigious quantities: they are not only incloſed in rocks of marble and limeſtone, as well as in earths and clays, but are actually incorporated and filled with the very ſubſtances in which they are incloſed. In fine, I am convinced, from repeated obſervation, that marbles, limeſtones, chalks, marles, clays, ſand, and almoſt all terreſtrial ſubſtances, whereever ſituated, are full of ſhells and other ſpoils of the ocean."

From theſe poſitions, which he lays down as facts, Mr Buffon draws the following concluſions:

1. The changes which the earth has undergone within theſe laſt 2000 or 3000 years muſt be inconſiderable, when compared with the great revolutions that took place in thoſe ages immediately ſucceeding the creation. The reaſon he gives for this aſſertion is, that terreſtrial ſubſtances could not acquire ſolidity but by the continued action of gravity: hence the earth muſt have been originally much ſofter than it is now, and therefore more apt to be changed by cauſes which cannot now affect it.

2. It ſeems an incontrovertible fact, that the dry land which we now inhabit, and even the ſummits of the higheſt mountains, were formerly covered with the waters of the ſea; for ſhells and other marine bodies are ſtill found upon the very tops of mountains.

3. The waters of the ſea have remained for a long track of time upon the ſurface; becauſe in many places, ſuch immenſe banks of ſhells have been diſcovered, that it is impoſſible ſo great a multitude of animals could exiſt at the ſame time.

4. From this circumſtance it likewiſe appears, that although the materials on the ſurface of the earth were then ſoft, eaſily diſunited, moved, and tranſported by the waters, yet theſe tranſportations could not be ſuddenly effected: they muſt have been gradual and ſucceſſive, as ſea-bodies are ſometimes found more than 1000 feet below the ſurface; and ſuch a thickneſs of earth or ſtone could not be accumulated in a ſhort time.

5. It is impoſſible theſe effects could be owing to the univerſal deluge. For though we ſhould ſuppoſe that all the ſhells in the bottom of the ocean ſhould be depoſited upon the dry land; yet, beſides the difficulty of eſtabliſhing this ſuppoſition, it is plain, that as ſhells are found incorporated in marble, and in the rocks of the higheſt mountains, we muſt ſuppoſe theſe rocks and marbles to have been formed all at the very inſtant when the deluge took place; and that before this grand revolution, there were neither mountains, nor marbles, nor rocks, nor clays, nor matter of any kind ſimilar to what we are now acquainted with; as they all, with few exceptions, contain ſhells and other productions of the ocean. Beſides, at the time of the univerſal deluge, the earth muſt have acquired a conſiderable degree of ſolidity, by the action of gravity for more than 16 centuries. During the ſhort time the deluge laſted, therefore, it is impoſſible that the waters ſhould have overturned and diſſolved the whole ſurface of the earth to the greateſt depths.

6. It is certain (for what reaſon he does not mention), that the waters of the ſea have, at ſome period or other, remained for a ſucceſſion of ages upon what we now know to be dry land; and conſequently that the vaſt continents of Aſia, Europe, Africa, and America, were then the bottom of an immenſe ocean, replete with every thing which the preſent ocean produces.

7. It is likewiſe certain, that the different ſtrata of the earth are horizontal and parallel to each other. This parallel ſituation muſt therefore be owing to the operation of the waters, which have gradually accumulated the different materials, and given them the ſame poſition which the water itſelf invariably aſſumes.

8. It is certain that theſe ſtrata muſt have been gradually

dually formed, and are not the effect of any ſudden revolution; becauſe nothing is more frequent than ſtrata compoſed of heavy materials placed above light ones; which never could have happened if, according to ſome authors, the whole had been blended and diſſolved by the deluge, and afterwards precipitated.

9. No other cauſe than the motion and ſediments of water could poſſibly produce the regular poſition of the various ſtrata of which the ſuperficial part of this earth conſiſts. The higheſt mountains are compoſed of parallel ſtrata, as well as the loweſt valleys. Of courſe, the formation of mountains cannot be attributed to the ſhock of earthquakes, or to the eruptions of volcanoes. Such ſmall eminences as have been raiſed by volcanoes or convulſions of the earth, inſtead of being compoſed of parallel ſtrata, are mere maſſes of weighty materials, blended together in the utmoſt confuſion.

Having now, as he thinks, *proved*, that the dry and habitable part of the earth has remained for a long time under the waters of the ſea, and conſequently muſt have undergone the ſame changes that now take place at the bottom of the ſea, he proceeds to inquire what theſe changes are.

10. The ocean, ſince the creation of the world, has been conſtantly agitated by the tides, occaſioned by the action of the ſun and moon; and this agitation is greater in the equatorial than in the other parts of the globe, becauſe the action of the ſun and moon is there ſtrongeſt.

11. The earth performs a rapid motion on its axis; and conſequently its parts have a centrifugal force, which is alſo greateſt at the equator.

12. From the combined action of the two laſt mentioned cauſes, the tides and the motion of the earth, it may be fairly concluded, that although this globe had been originally a perfect ſphere, its diurnal motion, and the ebbing and flowing of the tides, muſt neceſſarily, in a ſucceſſion of time, have elevated the equatorial parts, by gradually carrying mud, earth, ſand, ſhells, &c. from other climates, and depoſiting them at the equator.

13. On this ſuppoſition, the greateſt inequalities on the ſurface of the earth ought to be found, and in fact are found, in the neighbourhood of the equator.

14. As the alternate motion of the tides has been conſtant and regular ſince the exiſtence of the world, it is natural to think, that, at each tide, the water carries from one place to another a ſmall quantity of matter, which falls to the bottom as a ſediment, and forms thoſe horizontal and parallel ſtrata that every where appear. Here it may indeed be objected, that as the flux is equal to, and regularly ſucceeded by, the reflux, the two contrary motions will balance each other; and whatever is brought in by the flux will be carried back by the reflux. The motion of the ocean, therefore, could never be the cauſe of the formation even of parallel ſtrata; much leſs of mountains, and all the inequalities to be obſerved in this globe. To this Mr Buffon replies, that the alternate motion of the waters is by no means equal; for the ſea has a continual motion from eaſt to weſt: the agitations occaſioned by the winds likewiſe produce great inequalities in the tides. It muſt alſo be acknowledged, that, by every motion of the ſea, particles of earth and other matter muſt be carried from one place and depoſited in another; and that theſe collections of matter muſt aſſume the form of parallel and horizontal ſtrata. Laſtly, this objection is obviated by a well known fact. On all coaſts where the ebbing and flowing of the ſea is diſcernible, numberleſs materials are brought in by the flux, which are not carried back by the reflux. The ſea gradually increaſes on ſome places and recedes from others; narrowing its limits by depoſiting earth, ſand, ſhells, &c. which naturally take a horizontal poſition. Theſe materials when accumulated, and elevated to a certain degree, gradually ſhut out the water, and remain for ever in the form of dry land.

15. The poſſibility of a mountain's being formed at the bottom of the ſea by the motion and ſediments of the water, will appear from the following conſiderations. On a coaſt which the ſea waſhes with violence during the flow of tide, ſome part of the earth muſt be carried off at every ſtroke of the waves. Even where the ſea is bounded by a rock, it is a known fact, that the rock itſelf is greatly waſted by the water; and conſequently that ſmall particles are carried off by the retreat of every wave. Thoſe particles of earth or ſtone are neceſſarily tranſported to ſome diſtance. Whenever the agitation of the water ceaſes, the particles are precipitated in the form of a ſediment, and lay the foundation of a firſt ſtratum, which is either horizontal or inclined, according to the ſituation of the ſurface on which they fall. This ſtratum is ſoon ſucceeded by another, produced by the ſame cauſe; and thus a conſiderable quantity of matter will be amaſſed, and depoſited in parallel beds. In proceſs of time this gradually accumulating maſs will become a mountain in the bottom of the ſea, exactly reſembling, both in external and internal ſtructure, thoſe mountains which we ſee on the dry land. If there happened to be ſhells in that part of the bottom of the ſea where we have ſuppoſed the ſediments to be depoſited, they will be covered, filled, and incorporated with the depoſited matter, and form a part of the general maſs. Theſe ſhells will be lodged in different parts of the mountain, correſponding to the times in which they were depoſited: thoſe which lay at the bottom before the firſt ſtratum was formed, will occupy the loweſt ſtation; the others will be found in places more elevated.

16. It has been imagined that the agitation of the ſea produced by the winds and tides is only ſuperficial, and does not affect the bottom, eſpecially where it lies very deep. But it ought to be remembered, that whatever be the depth, the whole maſs is put in motion by the tides at the ſame time; and that, in a fluid globe, this motion would be communicated even to the centre. The attractive power, which occaſions the flux and reflux, is penetrating. It acts equally upon every particle of the maſs; ſo that the quantity of its force at different depths may be determined by calculation. We cannot therefore heſitate in pronouncing, that the tides, the winds, and all other cauſes of motion in the ſea, muſt produce heights and inequalities in its bottom; and that theſe heights muſt uniformly be compoſed of regular ſtrata either horizontal or inclined. The heights thus produced will gradually augment; like the waves which formed them, they will mutually reſpect each other; and if the extent of the

baſe be great, in a courſe of years they will form a vaſt chain of mountains.

17. Whenever eminences are formed, they interrupt the uniform motion of the waters, and produce currents. Between two neighbouring heights in the bottom of the ocean there muſt be a current which will follow their common direction, and, like a river, cut a channel, the angles of which will be alternately oppoſite through the whole extent of its courſe. Theſe heights muſt continually increaſe: for, during the flow, the water will depoſit its ordinary ſediment upon their ridges; and the waters which are impelled by the current will force along, from great diſtances, quantities of matter, which will ſubſide between the hills, and, at the ſame time, ſcoop out a valley with correſponding angles at their foundation. Now, by means of theſe different motions and ſediments, the bottom of the ocean, though formerly ſmooth, muſt ſoon be furrowed and interſperſed with hills and chains of mountains, as we actually find it at preſent. The ſoft materials of which the eminences were originally compoſed, would gradually harden by their own gravity. Such of them as conſiſted of ſandy and cryſtalline particles would produce thoſe enormous maſſes of rock and flint, in which we find cryſtals and other precious ſtones. Others, compoſed of ſtony particles mixed with ſhells, give riſe to thoſe beds of limeſtone and marble in which vaſt quantities of ſea-ſhells are ſtill found incorporated.

18. Theſe cauſes, as before obſerved, act with greater force under the equator than in other climates; for there the tides are higher, and the winds more uniform. The mountains of Africa and Peru are the higheſt in the world; often extending through whole continents, and ſtretching to great diſtances under the waters of the ocean. The mountains of Europe and Aſia, which extend from Spain to China, are not ſo high as thoſe of Africa and South America. According to the relations of voyagers, the mountains of the north are but ſmall hills, when compared with the mountains of the equatorial regions. Thoſe prodigious chains of mountains which run from eaſt to weſt in the old continent, and from north to ſouth in the new, muſt have been formed by the general motion of the tides. But the origin of the leſs conſiderable hills muſt be aſcribed to particular motions occaſioned by winds, currents, and other irregular agitations of the ſea.

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Having thus diſcuſſed ſome very important points reſpecting the theory of the earth, our author now proceeds to anſwer other queſtions which ſeem ſtill more difficult of ſolution.

19. But how has it happened that this earth, which we and our anceſtors have inhabited for ages, which, from time immemorial, has been an immenſe continent, dry, compact, and removed from the reach of water, ſhould, if formerly the bottom of an ocean, be now exalted to ſuch a height above the waters, and ſo completely ſeparated from them? Since the waters remained ſo long upon the earth, why have they now deſerted it? What accident, what cauſe, could introduce a change ſo great? A little reflection, ſays he, will furniſh us with at leaſt plauſible ſolutions to theſe ſeemingly ſo difficult queſtions. We daily obſerve the ſea gaining ground on certain coaſts, and loſing it on others. We know that the ocean has a general and uniform motion from eaſt to weſt: that it makes violent efforts againſt the rocks and low grounds which encircle it; that there are whole provinces which human induſtry can hardly defend againſt the fury of the waves; and that there are inſtances of iſlands which have but lately emerged from the waters, and of regular inundations. Hiſtory informs us of inundations and deluges of a more extenſive nature. Ought not all this to convince us, that the ſurface of the earth has experienced very great revolutions, and that the ſea may have actually given up poſſeſſion of the greateſt part of the ground which it formerly occupied? For example, let us ſuppoſe, that the old and new worlds were formerly but one continent; and that, by a violent earthquake, the ancient Atlantis of Plato was ſunk. The conſequence of this mighty revolution muſt neceſſarily be, that the ſea would ruſh in from all quarters, and form what is now called the *Atlantic Ocean;* and vaſt continents, perhaps thoſe we now inhabit, would of courſe be left dry. This great revolution might be effected by the ſudden failure of ſome immenſe cavern in the interior parts of the globe, and an univerſal deluge would infallibly ſucceed.

20. But, however conjectures of this kind may ſtand, it is certain that ſuch a revolution hath happened: and we may even believe that it hath happened naturally; for if a judgment of the future is to be formed from the paſt, we have only to attend carefully to what paſſes before our eyes. It is a fact eſtabliſhed by the repeated obſervation of voyagers, that the ocean has a conſtant motion from eaſt to weſt. This motion, like the trade-winds, is not only perceived between the tropics, but through the whole temperate climates, and as near the poles as navigators have approached. As a neceſſary conſequence of this motion, the Pacific Ocean muſt make continual efforts againſt the coaſts of Tartary, China, and India; the Indian Ocean muſt act againſt the eaſt coaſt of Africa; and the Atlantic muſt in a ſimilar manner act againſt all the eaſtern coaſts of America. Hence the ſea muſt have gained, and will always continue to gain, on the eaſt, and to loſe on the weſt. This of itſelf would be ſufficient to prove the poſſibility of the change of the ſea into land, and land into ſea. If ſuch is the natural effect of the ſea's motion from eaſt to weſt, may it not reaſonably be ſuppoſed, that Aſia, and all the eaſtern continent, is the moſt ancient country in the world? and that Europe, and part of Africa, eſpecially the weſt parts of theſe continents, as Britain, France, Spain, &c. are countries of a more recent date?

21. The cauſe of the perpendicular fiſſures with which the earth abounds, is eaſily inveſtigated. As various materials conſtituting the different ſtrata were tranſported by the waters, and depoſited in the form of ſediments, they would at firſt be in a very diluted ſtate, and would gradually harden and part with the ſuperfluous quantity of moiſture they contained. In proceſs of time, drying, they would naturally contract and ſplit at irregular diſtances. Theſe fiſſures neceſſarily aſſumed a perpendicular direction: becauſe in this direction the action of gravity of one particle upon another is equal to nothing: but it acts directly oppoſite to this deſcription, in a horizontal ſituation: the di-

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minution in bulk could have no ſenſible effect but in a vertical line. The contraction of the parts in drying, therefore, and not the contained water forcing an iſſue, as has been alleged by ſome, is the cauſe of perpendicular fiſſures; for it may be often remarked, that the ſides of thoſe fiſſures, through their whole extent, correſpond as exactly as the two ſides of a ſplit piece of wood.

22. Perpendicular fiſſures vary greatly as to the extent of their openings. Some are about half an inch or an inch; others a foot or two feet; ſome extend ſeveral fathoms, and give riſe to thoſe vaſt precipices which ſo frequently occur between oppoſite parts of the ſame rocks, in the Alps and other high mountains. It is plain, that the fiſſures, the openings of which are ſmall, have been occaſioned ſolely by drying. But thoſe which extend ſeveral feet are partly owing to another cauſe; namely, the ſinking of the foundation upon one ſide, while that of the other remains firm. If the baſe ſinks but a line or two, when the height is conſiderable, an opening of ſeveral feet, or even fathoms, will be the conſequence. When rocks are founded on clay or ſand, they ſometimes ſlip a little to one ſide; and the fiſſures are of courſe augmented by this motion.

23. The large openings, however, and prodigious cuts, which are to be met with in rocks and mountains, are to be aſcribed to another cauſe. They could be produced no other way than by the ſinking of immenſe ſubterraneous caverns, that were unable any longer to ſuſtain their incumbent load. But theſe cuts or intervals in mountains are not of the ſame nature with the perpendicular fiſſures: they appear to have been ports opened by the hand of nature for the communication of nations. This ſeems to be the intention of all large openings in chains of mountains, and of thoſe ſtraits by which different parts of the ocean are connected; as the ſtraits of Thermopyle, of Gibraltar, &c. the gaps or ports in mount Caucaſus, the Cordeleras, &c.

24. But the greateſt changes upon the ſurface of the earth are occaſioned by rains, rivers, and torrents from the mountains. Theſe derive their origin from vapours raiſed by the ſun from the ſurface of the ocean, and which are tranſported by the winds through every climate. The progreſs of theſe vapours, which are ſupported by the air, and tranſported at the pleaſure of the winds, is interrupted by the tops of the mountains, where they accumulate into clouds, and fall down in the form of rain, dew, or ſnow. At firſt, theſe waters deſcended into the plains without any fixed courſe; but they gradually hollowed out proper channels for themſelves. By the power of gravity they ran to the bottom of the mountains; and penetrating or diſſolving the lower grounds, they carried along with them ſand and gravel, cut deep furrows in the plains, and thus opened paſſages to the ſea, which always receives as much water by rivers as it loſes by evaporation. The windings in the channels of rivers have uniformly correſponding angles on their oppoſite banks; and as mountains and hills, which may be regarded as the banks of the valleys by which they are ſeparated, have likewiſe ſinuoſities with correſponding angles, this circumſtance ſeems to demonſtrate, that the valleys have been gradually formed by currents of the ocean, in the ſame manner as the channels of rivers have been produced. Rivers produce conſiderable changes on the ſurface of the earth; they carry off the ſoil, wear away the moſt ſolid rocks, and remove every thing that oppoſes their paſſage. The waters of the clouds alſo, which deſcend upon the mountains, by continually waſhing away ſome part of the earth, tend to level them with the plains; and would undoubtedly do ſo, if time enough were allowed for that purpoſe.

25. From what has been advanced, we may conclude, that the flux and reflux of the ocean have produced all the mountains, valleys, and other inequalities on the ſurface of the earth: that currents of the ſea have ſcooped out the valleys, elevated the hills, and beſtowed on them the correſponding directions: that the ſame waters of the ocean, by tranſporting and depoſiting earth, &c. have given riſe to the parallel ſtrata: that the waters from the heavens gradually deſtroy the effects of the ſea, by continually diminiſhing the height of the mountain, filling up the valleys, and choaking up the mouths of rivers; and by reducing every thing to its proper level, they will in time reſtore the earth to the ſea, which by its natural operations will again create new continents interſperſed with mountains and valleys, and every way ſimilar to thoſe which we now inhabit.

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Thus far our author preſerves ſome degree of plauſibility in his reaſoning; but in his account of the original formation of the earth, he certainly goes to the utmoſt verge of *probability*, or rather of *poſſibility*, in his ſuppoſitions. According to him, all the planets in our ſyſtem were originally parts of the ſun himſelf. They were detached from his body all at once by a mighty ſtroke of a comet. The poſſibility of driving off ſuch a quantity of matter from the ſun by a ſingle ſtroke, he labours hard to prove; but this is far from being the greateſt difficulty in his ſyſtem.—"To this theory (ſays he) it may be objected, that if the planets had been driven off from the ſun by a comet, in place of deſcribing circles round him, they muſt, according to the law of projectiles, have returned to the ſame place from whence they had been forced; and, therefore, that the projectile force of the planets cannot be attributed to the impulſe of a comet.

"I reply, that the planets iſſued not from the ſun in the form of globes, but in the form of torrents; the motion of whoſe anterior particles behoved to be accelerated by thoſe behind, and the attraction of the anterior particles would alſo accelerate the motion of the poſterior; and that this acceleration, produced by one or both of theſe cauſes, might be ſuch as would neceſſarily change the original motion ariſing from the impulſe of the comet; and that, from the cauſe, might reſult a motion ſimilar to what takes place in the planets; eſpecially when it is conſidered, that the ſhock of the comets removes the ſun out of its former ſtation. This reaſoning may be illuſtrated by an example. Suppoſe a muſket-ball diſcharged from the top of a mountain, and that the force of the powder was ſufficient to ſend it beyond a ſemidiameter of the earth: it is certain that this ball would revolve round the earth, and return at every revolution to the place from whence it had been diſcharged. But, inſtead of a muſket-ball, if a rocket were employed, the continued action of the fire would greatly accelerate the original

original impulſive motion. This rocket would by no means return to the ſame point like the ball; but, *cæteris paribus*, would deſcribe an orbit, the perigee of which would be more or leſs diſtant from the earth in proportion to the greatneſs of the change produced in its direction by the accelerating force of the fire. In the ſame manner, if the original projectile force impreſſed by the comet on the torrent of ſolar matter was accelerated, it is probable that the planets formed by this torrent acquired their circular or elliptical movements around the ſun."

In like manner he accounts for the formation and circulation of the ſecondary planets. The revolutions of the primaries on their axes, he accounts for from the obliquity of the original ſtroke impreſſed by the comet. The oblate ſpheroidal figure of the earth is eaſily deduced from its diurnal motion, and the fluidity of the whole at its firſt formation. The flattening at the poles he eſtimates at about one 230th part of the whole. As this computation differs conſiderably from the account given by the mathematicians who were ſent to different parts of the world on purpoſe to determine the figure of the earth, and who made the flatneſs at the poles equal to one 175th part of the whole, he ſuppoſes this difference to have ariſen from changes that have ſince taken place on the ſurface of the earth, occaſioned by the cauſes already mentioned. He then proceeds to account for the formation of all things, in the following manner.—"It is therefore evident, that the earth aſſumed its figure when in a melted ſtate; and, to purſue our theory, it is natural to think, that the earth, when it iſſued from the ſun, had no other form but that of a torrent of melted and inflamed matter: that this torrent, by the mutual attraction of its parts, took on a globular figure, which its diurnal motion changed into a ſpheroid: that when the earth cooled, the vapours, which were expanded like the tail of a comet, gradually condenſed, and fell down in the form of water upon the ſurface, depoſiting at the ſame time a ſlimy ſubſtance mixed with ſulphur and ſalts; part of which was carried by the motion of the waters into the perpendicular fiſſures of the ſtrata, and produced metals; and the reſt remained on the ſurface, and gave riſe to the vegetable mould which abounds in different places, with more or leſs of animal or vegetable particles, the organization of which is not obvious to the ſenſes.

"Thus the interior parts of the globe were originally compoſed of vitrified matter; and, I believe, they are ſo at preſent. Above this vitrified matter were placed thoſe bodies which the fire had reduced to the ſmalleſt particles, as ſands, which are only portions of glaſs; and above theſe pumice-ſtones and the ſcoriæ of melted matter, which produced the different clays. The whole was covered with water to the depth of 500 or 600 feet, which originated from the condenſation of the vapours when the earth began to cool. This water depoſited a ſtratum of mud, mixed with all thoſe matters which are capable of being ſublimed or exhaled by fire: and the air was formed of the moſt ſubtile vapours, which, from their levity, roſe above the water.

"Such was the condition of the earth when the tides, the winds, and the heat of the ſun, began to introduce changes on its ſurface. The diurnal motion of the earth, and that of the tides, elevated the waters in the equatorial regions, and neceſſarily tranſported thither great quantities of ſlime, clay, and ſand; and by thus elevating thoſe parts of the earth, they perhaps ſunk thoſe under the poles about two leagues, or a 230th part of the whole, as was formerly remarked: for the waters would eaſily reduce into powder pumice-ſtones, and other ſpongy parts of the vitrified matter upon the ſurface; and by this means excavate ſome places and elevate others, which, in time, would produce iſlands and continents, and all thoſe inequalities on the ſurface, which are more conſiderable towards the equator than towards the poles. The higheſt mountains lie between the tropics and the middle of the temperate zones, and the loweſt from the polar circles towards the poles. Indeed, both the land and ſea have moſt inequalities between the tropics, as is evident from the incredible number of iſlands peculiar to thoſe regions."

18
Dr Hutton's theory.

V. In the firſt volume of the Edinburgh Philoſophical Tranſactions a new theory of the earth has been laid down at conſiderable length by Dr Hutton; of which the following is an abſtract.

The general view of the terreſtrial ſyſtem conveys to our minds an idea of a "fabric, erected in wiſdom, to obtain a purpoſe worthy of the power that is apparent in the production of it."

19
Earth formed to be inhabited.

The end for which it was formed, as far as we can comprehend our author's meaning, is, that it might be an habitation for living creatures; and we are enabled to underſtand the conſtitution of this earth as a thing formed by deſign, "not only by ſeeing thoſe general operations which depend on its conſtruction as a machine, but alſo by perceiving how far the particulars in the conſtruction of that machine depend on the operations of the globe."

20
Compoſed of three principal parts.

In taking a comprehenſive view of the mechaniſm of the globe, we obſerve three principal parts of which it is compoſed; and which, by being properly adapted to one another, form it into an habitable world. Theſe are the ſolid body of the earth, the waters of the ocean, and the atmoſphere ſurrounding the whole. On theſe our author obſerves,

1. The parts of the terreſtrial globe more immediately expoſed to our view are ſupported by a central body commonly ſuppoſed, but without any good reaſon, to be ſolid and inert.

2. The aqueous part, reduced to a ſpherical form by gravitation, has become oblate by the earth's centrifugal force. Its uſe is to receive the rivers, be a fountain of vapours, and to afford life to innumerable animals, as well as to be the ſource of growth and circulation to the organized bodies on earth.

3. The irregular body of land, raiſed above the level of the ſea (though the ſmalleſt of theſe large diviſions), is by far the moſt intereſting, as immediately neceſſary to the ſupport of animal life.

4. The atmoſphere ſurrounding the whole is evidently neceſſary for innumerable purpoſes of life and vegetation, neither of which could ſubſiſt a moment without it.

21
Powers by which it is upheld.

Having thus conſidered the mechaniſm of the globe, Dr Hutton proceeds to inveſtigate the powers by which it is upheld.—Theſe are the gravitating and projectile forces by which the planets are guided, the influence of light and heat, cold and condenſation; to which may be added electricity and magnetiſm.

22
Why the land muſt neceſſarily decay, and at laſt be deſtroyed.

In the further purſuit of our general or preparatory ideas, the Doctor obſerves, that "a ſolid body of land could not have anſwered the purpoſe of a habitable world, for a ſoil is neceſſary for the growth of plants; but a ſoil is only the materials collected from the deſtruction of the ſolid land. Therefore the ſurface of this land, inhabited by man, is made by nature to decay, in diſſolving from the hard and compact ſtate in which it is found below the ſoil; and this ſoil is neceſſarily waſhed away by the continual circulation of the water running from the ſummits of the mountains." Thus he ſuppoſes that the land muſt at laſt be entirely deſtroyed; a misfortune unavoidable from the very conſtitution of the globe as an habitable world. It remains, therefore, to be conſidered, whether there be, "in the conſtitution of this world, a reproductive operation by which a ruined conſtitution may be again repaired, and a duration and ſtability procured to the machine conſidered as capable of ſuſtaining plants and animals?" The ſolution of this queſtion, he ſays, is perhaps within the reach of human ſagacity, and, as he juſtly obſerves, might add ſome luſtre to ſcience and the human intellect.

23
Marine animals of much higher antiquity than the human race.

With regard to the beginning of the world, though our author does not pretend to lay aſide the Moſaic accounts concerning the origin of man, yet, ſays he, "though there has not been found in natural hiſtory any document by which a high antiquity might be attributed to the human race, this is not the caſe with regard to the inferior animals, particularly thoſe which inhabit the ocean and its ſhores. We find in natural hiſtory monuments which prove that theſe animals had long exiſted; and we thus procure a meaſure for the computation of a period of time extremely remote, though far from being exactly aſcertained.— Thus, in finding the relics of ſea animals of every kind in the ſolid body of the earth, a natural hiſtory of thoſe animals is formed, which includes a certain portion of time; and for the aſcertaining this portion of time, we muſt again have recourſe to the operations of this world.

From a view of the preſent conſtruction and operations of nature, therefore, our author ſuppoſes, that we may underſtand what has formerly paſſed in the original formation of the globe; and then proceeds to reaſon in the following manner:

24
General view of the ſolid parts of the globe.

The ſolid parts of the globe are, in general, compoſed of ſand, gravel, argillaceous and calcareous ſtrata, or of theſe mixed with ſome other ſubſtances. Sand is ſeparated and ſized by ſtreams and currents; gravel is formed by the mutual attrition of ſtones agitated in water; and marly or argillaceous ſtrata have been collected by ſubſiding in water in which thoſe earthy ſubſtances had floated. Thus, ſo far as the earth is formed of theſe materials, it would appear to have been the production of water, winds, and tides.

25
Earth in a great meaſure compoſed of the exuviæ of marine animals.

The next inquiry of our author is into the origin of our land, which he ſeems willing to derive entirely from the exuviæ of marine animals. The only argument he makes uſe of for determining this moſt important point is drawn from the quantity of them to be met with in the different parts of it. "We find (ſays he) the marks of marine animals in the moſt ſolid parts of the earth; conſequently thoſe ſolid parts have been formed after the ocean was inhabited by thoſe animals which are proper to that fluid medium."

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That all the maſſes of marble or limeſtone are compoſed of the calcareous matter of marine bodies, he concludes, 1. From there being few in which ſome of thoſe objects may not be found which indicate the marine origin of the maſs; and a ſingle cockle-ſhell or piece of coral found in a marble or limeſtone quarry, will certainly prove it to have been originally at the bottom of the ſea as much as if it had been all compoſed of ſuch bodies. 2. In the calcareous ſtrata, which are evidently of marine origin, there are many parts of a ſparry ſtructure; which ſhows that in theſe places the original texture of thoſe beds has been diſſolved and a new ſtructure aſſumed. This change is produced by cryſtallization, in conſequence of a previous ſtate of fluidity; which has ſo diſpoſed the concreting parts, as to allow them to aſſume a regular ſhape and ſtructure proper to that ſubſtance. 3. There are, in all the regions of the earth, huge maſſes of calcareous matter in that cryſtalline or ſparry ſtate, in which perhaps no veſtige can be found of any organized body, nor any indication that ſuch calcareous matter had belonged to animals; but as, in other maſſes, this ſparry or cryſtalline ſtate is evidently aſſumed by the calcareous matter of the marine productions, we have no reaſon to derive theſe from any other ſource: and hence, ſays our author, we are led to conclude, that all the ſtrata of the earth, not only thoſe conſiſting of ſuch calcareous maſſes, but others ſuperincumbent upon theſe, have had their origin at the bottom of the ſea, by the collection of ſand and gravel, of ſhells, of coralline and cruſtaceous bodies, and of earths and clays variouſly mixed, or ſeparated and accumulated.

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"The general amount of our reaſoning (ſays he) is this; that nine-tenths perhaps, or 99 hundredths, of this earth, ſo far as we ſee, have been formed by natural operations of the globe, in collecting looſe materials and depoſiting them at the bottom of the ſea, conſolidating thoſe collections in various degrees, and either elevating thoſe conſolidated maſſes above the level on which they were formed, or lowering the level of that ſea."

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With regard to the raiſing of the land, thus formed at the bottom of the ſea, to ſome height above its ſurface, our author differs from Buffon, and contends, that "no motion of the ſea occaſioned by the earth revolving in this ſolar ſyſtem could bring about that end; for let us ſuppoſe the axis of the earth to be changed from the preſent poles and placed in the equinoctial line, the conſequence of this might indeed be the formation of a continent of land about each new pole, from whence the ſea would run towards the new equator; but all the reſt of the globe would remain an ocean. Some new points might be diſcovered, and others which appeared before above the ſurface of the ſea would be ſunk by the riſing of the water; but, on the whole, land could only be gained ſubſtantially at the poles. Nor could the continents, even ſuppoſing they had been originally produced in this manner, have continued ſtationary for many thouſand years, and preſented to us, every where below their ſurface, maſſes of conſolidated marble and other mineral ſubſtances, in a ſtate as different as poſſible from what they were originally. Beſides an operation, therefore, by which the

the earth at the bottom of the ſea ſhould be converted into an elevated land, or placed high above the level of the ocean, there is required a conſolidating power, by which the looſe materials that had ſubſided from water ſhould be formed into maſſes of the moſt perfect ſolidity, having neither water nor vacuity betwixt their conſtituent parts, nor in the pores of theſe conſtituent parts themſelves.

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This conſolidating power, he is of opinion, muſt lie out of the reach of common obſervation, becauſe the conſolidated maſſes on the ſurface of the earth are now in a ſtate of decay; and therefore we muſt look into theſe maſſes themſelves, in order to diſcover the cauſe by which they aſſumed their preſent form.

In entering upon the inveſtigation of this conſolidating power, our author obſerves, that there are only two ways in which the requiſite changes can happen, viz. ſimple congelation from a fluid ſtate, or a continual accretion of ſolid particles. Fire and water, therefore, may be conſidered as the general agents in this operation; and we are to conſider whether they have acted in the way of aqueous ſolution and cryſtallization, or in that of fuſion. If the former of theſe ways is ſuppoſed to be that in which the ſtrata in general have been conſolidated, we may look for a conſiderable degree of uniformity in its effects. "The action of water (he ſays) upon all different ſubſtances is what we are well acquainted with; and there is no reaſon to conclude any thing myſterious in its operation, unleſs we ſuppoſe an immenſe compreſſing power to have ſome effect in altering it. Compreſſion, however (he ſays), only alters the relation of evaporation to heat, or changes the degree of heat which water can contain. We are therefore to look for no occult quality in water acting at the bottom of the ſea more than on the ſurface of the earth. Time, indeed, may do a great deal where the courſe of the operation is ſlow; but where it is contrary to the nature of the things to produce the change in queſtion, it is plain that no length of time can have any effect."

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Again, if the maſſes have been conſolidated by cryſtallization, the bodies muſt firſt have been diſſolved in water as a menſtruum; and therefore another power is to be ſought for by which the water might again be extricated from thoſe endleſs labyrinths in which the ſolid matter of the ſtrata is depoſited, without leaving a fluid particle in its compoſition. There is likewiſe another difficulty in finding a ſource from whence the vaſt quantity of matter depoſited in theſe ſtrata ſhould be derived. Beſides, the water contained in the cavities and interſtices of theſe bodies compoſing ſtrata muſt be in a ſtagnating ſtate; and conſequently it can only act on the ſurface of thoſe cavities which are to be filled up. "But with what are they to be filled? Not with water; they are full of this already: Not with the ſubſtance of thoſe bodies which contain the water; this would be only to make one cavity in order to fill up another. If, therefore, the cavities of the ſtrata are to be filled with ſolid matter by means of water, there muſt be made to paſs through theſe porous maſſes water impregnated with ſome other ſubſtances in a diſſolved ſtate, and the aqueous menſtruum muſt be ſeparated from the diſſolved ſubſtance, and to depoſit the ſame in cavities through which the ſolution moves." This ſuppoſition is, however, according to our author, inadmiſſible; for, in the caſe of materials accumulated in the bottom of the ocean, there is no proper means for ſeparating the diſſolved matter from the water included in theſe enormous maſſes; nor are there any means by which a circulation in thoſe maſſes may be formed.

In the further proſecution of his ſubject, our author informs us, that "if water had been the menſtruum by which the conſolidating matter was introduced into the cavities of the ſtrata, maſſes of thoſe bodies that are ſoluble in water could only be found conſolidated; and theſe only in ſuch a ſtate as the ſimple ſeparation of the diſſolving water might produce. But this is far from being the caſe. We have ſtrata conſolidated by calcareous ſpar; a thing perfectly diſtinguiſhable from the ſtalactical concretion of the calcareous earth in conſequence of aqueous ſolution. We have ſtrata made ſolid by the formation of fluor; a ſubſtance, ſo far as we know, not ſoluble in water. We have ſtrata conſolidated with ſulphureous and bituminous ſubſtances, which do not correſpond to the ſolution in water. We have ſtrata conſolidated with ſiliceous matter in a ſtate totally different from that in which it is depoſited by water: we have them alſo conſolidated by almoſt all the various metallic ſubſtances, with their almoſt endleſs mixtures and ſulphureous compoſitions; that is to ſay, we find perhaps every different ſubſtance introduced into the interſtices of ſtrata which had been formed by ſubſidence at the bottom of the ſea."

32
Strata conſolidated by ſubſtances inſoluble in water.

33
Theſe probably conſolidated by heat and fuſion.

For theſe reaſons, our author thinks it more probable that the ſtrata have been conſolidated by heat and fuſion; and this hypotheſis, he imagines, will ſolve every difficulty. And as the queſtion is of the greateſt importance to natural hiſtory, he propoſes to inveſtigate it at great length; at the ſame time that the ſubject is generalized as much as poſſible.

34
Siliceous bodies ſuppoſed abſolutely inſoluble by water.

35
Probably diſſolved by an alkali in the fountain of Geyſer.

He conſiders, that among the various ſtrata which compoſe the earth, we find ſome ſtrata formed of *ſiliceous* and ſome of ſulphureous materials; and with one or other, or both of theſe ſubſtances, the ſtrata are ſo intimately mixed, that what has changed the ſiliceous or ſulphureous materials from a fluid to a ſolid ſtate, muſt likewiſe have materially affected the ſtrata which contain them. The former he looks upon to be abſolutely inſoluble in water; and there are many other bodies whoſe ſolubility is ſo ſmall, that it could not be diſcovered but by means of the ſiliceous matter. Of this an inſtance is adduced in the feldt-ſpar, a compound of ſiliceous, argillaceous, and calcareous earth, intimately united together; which being for ages expoſed to the weather, the calcareous part is diſſolved, and the ſiliceous left in form of a white ſoft earth; though it is uncertain whether this diſſolution be performed by means of pure water, or whether an acid be alſo concerned. Siliceous matter is undoubtedly contained in the water of the boiling fountain of Geyſer in Ireland; but he thinks that here it muſt be diſſolved by an alkali, one of the natural ſolvents of this earth. "It may therefore be aſſerted (ſays he), that no ſiliceous body having the hardneſs of flint, nor any cryſtallization of that ſubſtance, has ever been formed except by fuſion. If by any art this ſubſtance ſhall be diſſolved in ſimple water, or *made to cryſtallize from any ſolution*, in that caſe the aſſertion which has been here made may be denied."

36 Bodies penetrated by flinty matter in fuſion.

But beſides this proof he adduces another, ſuppoſed to be more direct; and that is, the penetration of many bodies with a flinty ſubſtance, which, according to every collateral circumſtance, muſt have been performed by the flinty matter in a ſtate of ſimple fuſion, and not in a ſtate of ſuſpenſion by any ſolvent. Flinty bodies are found perfectly inſulated in ſtrata of chalk and ſand: and here our author determines that it is *not poſſible* that flint matter could be conveyed into the middle of theſe ſtrata by a menſtruum in which it was diſſolved, and thus depoſited in that place, without the ſmalleſt trace of depoſition in the neighbouring parts. The form of theſe bodies alſo demonſtrates, in his opinion, "1. That they have been introduced among thoſe ſtrata in a fluid ſtate, by injection from ſome other place; 2. That they have been diſperſed in a variety of ways among thoſe ſtrata then deeply immerſed at the bottom of the ſea; and, 3. That they have been there congealed from the ſtate of fuſion, and have remained in that ſituation, while thoſe ſtrata have been removed from the bottom of the ocean to the ſurface of the preſent land."

37 Exemplified in chalk;

38 In petrified wood.

There are alſo ſpecimens brought from many different places, which contain in themſelves *the moſt evident marks of this injection of the flinty ſubſtance in a fluid ſtate*; and theſe are pieces of *foſſile wood* brought from England, Germany, and Loch Neagh in Ireland. Sometimes thoſe ſpecimens appear to have been previouſly penetrated by an irony or calcareous matter, and ſometimes not: "the injected flint, however (ſays he), appears to have penetrated the body of this wood immerſed at the bottom of the ſea, under an immenſe compreſſion of water. This appears from the wood being penetrated partially, ſome parts not being penetrated at all. Now, in the limits betwixt theſe two parts, we have the moſt convincing proofs that it had been flint in a ſimple fluid ſtate which had penetrated the wood, and not in a ſtate of ſolution.

39 Why the wood has not been penetrated by flint in a ſtate of ſolution.

"*Firſt*, Becauſe, however little of the wood is left unpenetrated, the diviſion is always diſtinct between the injected part and that which is not penetrated by the fluid flint. In this caſe the flinty matter has proceeded a certain length, which is marked, and no farther; and beyond this boundary there is no partial impregnation, nor a gradation of the flintifying operation, as there muſt have been if ſiliceous matter had been depoſited from a ſolution. *2dly*, The termination of the flinty impregnation has aſſumed ſuch a form preciſely as would have happened naturally from a fluid flint penetrating that body.

"In other ſpecimens of this mineralizing operation, foſſile wood, penetrated more or leſs with ferruginous or calcareous ſubſtance, has been afterwards penetrated with a flinty ſubſtance. In this caſe, with whatever different ſubſtances the woody body ſhall be ſuppoſed to have been penetrated in a ſtate of ſolution by water, the regular ſtructure of the plant would ſtill have remained, with its vacuities variouſly filled with the petrifying ſubſtances, ſeparated from the aqueous menſtruum, and depoſited in the vaſcular ſtructure of the wood.

"There cannot be a doubt with regard to the truth of this propoſition; for, as it is, we frequently find parts of the conſolidated wood with the vaſcular ſtructure remaining perfectly in its natural ſhape and ſituation; but if it had been by aqueous ſolution that the wood had been penetrated and conſolidated, all the parts of that body would be found in the ſame natural ſhape and ſituation.

"This, however, is far from being the caſe; for while in ſome parts the vaſcular ſtructure is preſerved entire, it is alſo evident, that in general the woody ſtructure is variouſly broken and diſſolved by the fuſion and cryſtallization of the flint."

4 Of the phurec ſubſtar

With regard to the ſecond kind of ſubſtances to be conſidered, and which are called by our author *ſulphureous*, he tells us, "that they are not ſoluble in water ſo far as we know, but fuſible by heat, and inflammable by means of heat and vital air. They are either more ſimple or more compound. The former conſiſt of phlogiſton united either with acid or metallic ſubſtances, the one forming ſulphur, properly ſo called, the other metals. The more compound kind are compoſed of oily matter produced by vegetables, and forming bituminous ſubſtances.

41 Metals not be neraliz by aqu ſolutio

"Sulphur is found naturally combined with metals, which are ſaid to be mineralized by it; and it is well known that this mineralization is performed by means of heat and fuſion; nor will any perſon ſkilled in chemiſtry pretend to ſay that this is done in the way of aqueous ſolution. The combination of iron and ſulphur, for inſtance, may be eaſily performed by fuſion; but this compound is reſolved into a vitriolic ſalt by aqueous ſolution."

42 Exemp fied in ferent ſtances

Our author further remarks, that unleſs all the ſubſtances of this kind were ſoluble in water, we ought not to ſay that any one of them is formed by aqueous ſolution; for there is ſuch a continued chain of connection between them, that all muſt have been formed either by aqueous ſolution or by means of heat and fuſion. In one maſs, for inſtance, we find, 1. Pyrites, containing ſulphur, iron, and copper: 2. Blend, conſiſting of iron, ſulphur, and calamine: 3. Galena, conſiſting of lead and ſulphur: 4. Marmor metallicum, conſiſting of terra ponderoſa ſaturated with the vitriolic acid, a ſubſtance inſoluble in water: 5. A ſaturation of calcareous earth with the acid of fluor, forming a ſubſtance likewiſe inſoluble in water: 6. Calcareous ſpar of different kinds, being calcareous earth ſaturated with fixed air, and ſomething alſo which makes a variety: And, laſtly, Siliceous ſubſtance, or quartz cryſtals. Unleſs, therefore, every one of theſe different ſubſtances were ſoluble in water, and cryſtallizable from it, we will look in vain for any explanation of theſe appearances by means of aqueous ſolution; while heat being capable of rendering all theſe ſubſtances fluid, they may be with the greateſt ſimplicity tranſported from one place to another; and they may be made to concrete altogether at the ſame time, and diſtinctly ſeparate in any place.

4 Suppo proof an Hu rian m ral.

But what puts the matter beyond all doubt with our author, is a ſpecimen of ore taken from an Hungarian mine, and which contains petro-ſilex, pyrites, and cinnabar, ſo mixed together and cryſtallized upon one another, that it is impoſſible to conceive any one of theſe bodies to have had its fluidity and concretion from a cauſe which had not affected the other two. "Now (ſays our author), let thoſe who would deny the fuſion of this ſiliceous body explain how water could diſſolve theſe three different bodies, and depoſit them in their preſent ſhape. If, on the contrary, they have

have not the leaſt ſhadow of reaſon for ſuch a gratuitous ſuppoſition, the preſent argument muſt be admitted in its full force."

The next argument in favour of our author's doctrine is drawn from the exiſtence of metallic bodies in their malleable ſtate in the bowels of the earth. In this ſituation they are alſo commonly attended with ſuch evident marks of fuſion, that it is impoſſible to deny their having been really melted; and for the truth of this he appeals, among a thouſand inſtances, to the great native maſs of iron found by Dr Pallas in Siberia.

Oily or bituminous bodies are found variouſly intermixed with mineral ſubſtances, as well as forming diſtinct ſtrata of themſelves. Vegetables afford oily and reſinous matters; which being collected at the bottom of the ocean are there formed into ſtrata, afterwards changed by various degrees of heat, and the evaporation of their more fluid parts. "In order to underſtand this (ſays our author), it muſt be conſidered, that, while immerſed in water, and under inſuperable compreſſion, the vegetable, oily, and reſinous ſubſtances would appear to be unalterable by heat; and it is only in proportion as certain chemical ſeparations take place, that thoſe inflammable bodies are changed in their ſubſtance by the application of heat. Now, the moſt general change of this kind is by evaporation, or the diſtillation of their more volatile parts; by which oily ſubſtances become bituminous, and bituminous ſubſtances become coaly. There is here a gradation, which is beſt underſtood by comparing the two extremes. On the one hand, we know by experiment, that oily and bituminous ſubſtances can be melted, and partly changed into vapour by heat; and that they become harder and denſer in proportion as the more volatile parts have evaporated from them. On the other hand, coaly ſubſtances are deſtitute of fuſibility and volatility, in proportion as they have been expoſed to greater degrees of heat, and to other circumſtances favourable to the diſſipation of their more volatile and fluid parts. If, therefore, in mineral bodies we find the two extreme ſtates of this combuſtible ſubſtance, and alſo the intermediate ſtates, we muſt either conclude that this particular operation of heat has been thus actually employed in nature, or we muſt explain thoſe appearances by ſome other means in as ſatisfactory a manner, and ſo as ſhall be conſiſtent with other appearances. In this caſe it will avail nothing to have recourſe to the falſe analogy of water diſſolving and cryſtallizing ſalts, which has been ſo much employed for the explanation of other mineral appearances. The operation here in queſtion is of a different nature, and neceſſarily requires both the powers of heat and proper conditions for evaporation. Therefore, in order to decide the point with regard to what is the power in nature, by which mineral bodies have become ſolid, we have only to find a bituminous ſubſtance in the moſt complete ſtate of coal, intimately connected with ſome other ſubſtance which is more generally found conſolidating the ſtrata, and aſſiſting in the concretion of mineral ſubſtances. A moſt undoubted proof of this kind our author has in his poſſeſſion, viz. a maſs in which are blended together coal of the moſt fixed kind, quartz, and marmor metallicum. The ſpecimen alſo is contained in a rock, which every naturaliſt, he ſays, will allow to have been produced by fire and fuſion.

48
Formation of the different kinds of coal.

The ſtrata of foſſil coal are found in almoſt every intermediate ſtate, as well as in thoſe of bitumen and charcoal. Of the former kind is that foſſil coal which melts and becomes fluid by heat; of the latter, is that ſpecies found both in Wales and Scotland, which is perfectly infuſible in the fire, and burns like coaks without flame or ſmoke. The former abounds in oily matter; the latter has been diſtilled by heat until it has become a *caput mortuum*, or perfect coal. The more volatile parts of theſe bodies are ſometimes found in their ſeparate ſtate. Thus at Raith in Fifeſhire, there is a ſtratum of limeſtone, which, though but ſlightly tinged with a black colour, contains bituminous matter like pitch, in many cavities which are lined with calcareous ſpar cryſtallized. Now, it is to be obſerved, that had the cavity in the ſolid limeſtone or marble, which is lined with calcareous cryſtals containing pyrites, been thus incruſted by means of filtration with water, this water muſt have diſſolved calcareous ſpar, pyrites, and bitumen. But theſe natural appearances would not even be ſolved by this hypotheſis of diſſolution and filtration of theſe ſubſtances. There is alſo required, firſt, a cauſe for the ſeparation of theſe different ſubſtances from the aqueous menſtruum. 2. An explanation of the way in which a bitumen ſhould be formed into hard round bodies (our author has a ſpecimen of this kind) of the moſt ſolid ſtructure; and, laſtly, ſome probable means for this complicated operation being performed below the bottom of the ocean, in the cloſe cavity of a marble ſtratum.

49
Stratum containing liquid bituminous matter in Fifeſhire.

Having thus run through his courſe of argument for the probability of the ſtrata of earth being formed by heat and fuſion rather than by aqueous ſolution, our author proceeds to the examination of a phenomenon in the mineral kingdom, which may be thought inconſiſtent with what he has advanced; viz. the exiſtence of great maſſes of ſalt in the bowels of the earth. On this ſubject he obſerves, that the formation of maſſes of ſalt at the bottom of the ſea, without the aſſiſtance of ſubterraneous fire, is not a thing unſuppoſeable as at firſt ſight might appear. "Let us but ſuppoſe a rock placed acroſs the gut of Gibraltar (a caſe nowiſe unnatural), and the bottom of the Mediterranean would be certainly filled with ſalt; becauſe the evaporation from the ſurface of that ſea exceeds the meaſure of its ſupply. But ſtrata of ſalt formed in this manner at the bottom of the ſea are as far from being conſolidated by means of aqueous ſolution as a bed of ſand in the ſame ſituation; and we cannot ſuppoſe the conſolidation of ſuch a ſtratum of ſalt by means of water, without ſuppoſing ſubterranean heat employed to evaporate the brine which would ſucceſſively occupy the interſtices of the ſaline cryſtals. But this, it may be obſerved, is equally departing from the natural operation of water as the means for conſolidating the ſediment of the ocean, as if we were to ſuppoſe the ſame thing done by heat and fuſion. For the queſtion is not, if ſubterranean heat be of ſufficient intenſity for the purpoſe of conſolidating ſtrata by the fuſion of their ſubſtances? but, whether it be by means of this agent, ſubterraneous heat, or by water alone, without the operation of a

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On the production of foſſile ſalt by fuſion.

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melting heat, that thoſe materials have been variouſly conſolidated?"

51
From the appearance of the ſalt-rock in Cheſhire.

The Doctor now attempts to prove, from the appearance of the ſaline ſtrata, that they have been formed by ſubterraneous heat and fuſion as well as the others. "The ſalt-rock in Cheſhire lies in ſtrata of red marl. It is horizontal in its direction, and is dug 30 or 40 feet deep. The body of this rock is perfectly ſolid, and the ſalt in many places pure, colourleſs, and transparent, breaking with a ſparry, cubical texture: but the greateſt part is tinged by the admixture of the marl, and that in various degrees, from the ſlighteſt tinge of red to the moſt perfect opacity. Thus the rock appears as if it had been a maſs of fluid ſalt, in which had been floating a quantity of marly ſubſtance not uniformly mixed, but every where ſeparating and ſubſiding from the ſaline ſubſtance. There is alſo to be obſerved a certain regularity in the ſeparation of the tinging from the colourleſs ſubſtance; which, at a proper diſtance, gives to the perpendicular ſection of the rock a diſtinguiſhable figure in its ſtructure. When looking at this appearance near the bottom of the rock, it firſt preſented the figure of regular ſtratification; but upon examining the whole maſs of rock, this ſtratification was found only to take place near the bottom. At the top of the rock, the moſt beautiful figure, though the moſt diſtant from ſtratification, was obſerved. It was all compoſed of concentric circles, and theſe appeared to be the ſection of a maſs made up entirely of concentric ſpheres, like thoſe beautiful ſyſtems of configuration which agates ſo frequently preſent us with in miniature. In about eight or ten feet from the top, the circles growing large, were blended together, and gradually loſt their regular appearance, until at a greater depth they again aſſumed that of a regular ſtratification. This regular arrangement of the floating marly ſubſtance in the body of the ſalt, which is that of the ſtructure of a coated pebble, or that of concentric ſpheres, is altogether inexplicable upon any other ſuppoſition than the perfect fluidity or fuſion of the ſalt, and the attractions and repulſions of the contained ſubſtances. It is in vain to look in the operations of ſolution and evaporation for that which nothing but perfect fluidity and fuſion can explain.

52
From the mineral alkali on Teneriff.

"This example of a mineral ſalt congealed from a melted ſtate, may be confirmed by another argument ſuggeſted by Dr Black, *viz.* an alkaline ſalt found in a mineral ſtate, and deſcribed in the Philoſoph. Tranſac. for 1771. The foſſile alkali cryſtallizes from a diſſolved ſtate, in combining itſelf with a large quantity of water, in the manner of alum: and in this caſe the water is eſſential to the conſtitution of that ſolid cryſtalline body; for, upon the evaporation of the water, the tranſparent ſalt loſes its ſolidity, and becomes a white powder. If, inſtead of being gently dried, the cryſtalline ſalt is ſuddenly expoſed to a ſufficient degree of heat (that is, ſomewhat more than the heat of boiling water), it enters into the ſtate of aqueous fuſion, and boils, emitting the water by means of which it had been cryſtallized in the cold, and rendered fluid in that heated ſtate. It cannot be cryſtallized from a diſſolved ſtate without the combination of that quantity of water; nor can that water be ſeparated without deſtroying its cryſtalline ſtate. But in this mineral ſpecimen we have a ſolid cryſtalline ſalt, with a ſtructure which, upon examination, appears to be ſparry and radiated like the zeolite. It contains no water in its cryſtallization, but melts in a ſufficient heat without any aqueous fuſion. Therefore this ſalt muſt have been in a fluid ſtate of fuſion immediately before its congelation and cryſtallization.

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"Another example may be drawn from the iron-ſtone, which is commonly found among the argillaceous ſtrata attendant upon foſſile coal, both in Scotland and England. This ſtone is generally found among the bituminous ſchiſtus or black argillaceous ſtrata, either in ſeparate maſſes of various ſhapes and ſizes, or forming of itſelf ſtrata which are more or leſs continuous in their direction among the ſchiſtus or argillaceous beds. This mineral contains in general from 40 to 50 *per cent.* of iron, and it loſes near one-third of its weight in calcination. Before calcination it is of a grey colour, is not penetrable by water, and takes a poliſh. In this ſtate therefore it is perfectly ſolid; but being calcined, it becomes porous, red, and tender. The fact to be proved with regard to theſe iron ſtones is, that they have acquired their ſolid ſtate from fuſion, and not in concreting from any aqueous ſolution. A ſpecies of this kind of ſtone is found at Aberlady in Eaſt Lothian, reſembling an oblate or much compreſſed ſphere, and the ſize from two or three inches diameter to more than a foot. In the circular or horizontal ſection they preſent the moſt elegant ſeptarium: and from the examination of this particular ſtructure, the following concluſions may be drawn.

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"1. That the ſepta have been formed by the uniform contraction of the internal parts of the ſtone, the volume of the central parts diminiſhing more than that of the circumference; by which means the ſeparations of the ſtone diminiſh in a progreſſion from the centre towards the circumference.

"2. There are only two ways in which the ſepta muſt have received the ſpar with which they are filled more or leſs; either, firſt, by inſinuation into the cavity of theſe ſepta after they were formed; or, ſecondly, by ſeparation from the ſubſtance of the ſtone at the ſame time that the ſepta were forming.

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"Were the former of theſe ſuppoſitions true, appearances would be obſervable, ſhowing that the ſparry ſubſtance had been admitted either through the porous ſtructure of the ſtone, or through proper apertures communicating from without. Now, if either of theſe had been the caſe, and the ſtone had been conſolidated from no other cauſe than concretion from a diſſolved ſtate, that particular ſtructure of the ſtone by means of which the ſpar had been admitted muſt appear at preſent upon an accurate examination. This, however, is not the caſe; and we might reſt the argument here: The ſepta reach not the circumference; the ſurface of the ſtone is ſolid and uniform in every part; and there is not any appearance of the ſpar in the argillaceous earth around the ſtone. It therefore neceſſarily follows, that the contraction of the iron-ſtone, in order to form the ſepta, and the filling the cavities with ſpar, had proceeded *pari paſſu*; and that this operation muſt have been brought about by means of fuſion or by congelation from a ſtate of ſimple fluidity and expanſion.

"There is one fact more, which is well worth our attention; *viz.* the cryſtallizations which are found in

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cloſe cavities of the moſt ſolid bodies. Theſe concretions are well known to naturaliſts, and form part of the beautiful ſpecimens which are to be found in the cabinets of collectors, and which the German mineraliſts have named *druſen*." Our author, however, conſiders only one of theſe ſpecies, which is of the agate kind. It belongs to the kind of ſtones frequent in this country, which are commonly called *pebbles*. Many of them are filled with a ſiliceous cryſtallization, which evidently proceeds from the circumference towards the centre. Many of them again are hollow. They are uniformly lined with cryſtallized ſubſtances; and it is proper to attend to this circumſtance, that the cavity is perfectly incloſed with many ſolid coats impervious to air or water; but particularly with the external cortical part, which is extremely hard, takes the higheſt poliſh, and is of the moſt perfect ſolidity, admitting nothing but the paſſage of light and heat.

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"Within theſe cavities we find, firſt, the coats of cryſtals with which this cavity is always lined: and this is general to all ſubſtances concreting in ſimilar circumſtances from a ſtate of fuſion; for when thus at liberty they naturally cryſtallize. 2. We have frequently a ſubſequent cryſtallization ſet upon the firſt, and more or leſs immerſed in it. 3. There is alſo ſometimes a third cryſtallization ſuperincumbent on the ſecond, in like manner as the ſecond was upon the firſt. Our author has one ſpecimen in which the primary cryſtals are ſiliceous; the ſecond thin foliaceous cryſtals of deep red but tranſparent ore, forming elegant figures that have the form of roſes; the tertiary cryſtallization is a froſting of ſmall ſiliceous cryſtals upon the edges of the foliaceous cryſtals. In other ſpecimens there is firſt a lining of colourleſs ſiliceous cryſtals, then another lining of amethyſtine cryſtals, and ſometimes within that fuliginous cryſtals. Upon theſe fuliginous and amethyſtine cryſtals are many ſphericles or hemiſpheres of red compact iron-ore like hæmatites. In others again, the primary cryſtals are ſiliceous, and the ſecondary calcareous. Of this kind there is one in the Doctor's poſſeſſion, which has upon the calcareous cryſtals beautiful tranſparent ſiliceous cryſtals, and iron ſphericles upon theſe. He has alſo an agate formed of various red and white coats, and beautifully figured. The cavity within the coated part of the pebble is filled up without vacuity; firſt with colourleſs ſiliceous cryſtals; ſecondly, with fuliginous cryſtals; and, thirdly, with white or colourleſs calcareous ſpar. But between the ſpar and cryſtals there are many ſphericles, ſeemingly of iron, half ſunk into each of theſe two different ſubſtances."

From the foregoing facts our author now draws the following concluſions.

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"1. That concretion had proceeded from the ſurface of the agate inwards. This neceſſarily follows from the nature of thoſe figured bodies, the figures of the external coats always determining the ſhape of thoſe within, and never contrariwiſe, thoſe within affecting thoſe without.

"2. That when the agate was formed, the cavity then contained every thing which is now found in it, and nothing more.

"3. That the contained ſubſtances muſt have been in a fluid ſtate, in order to their cryſtallizing.

"4. That as this fluid ſtate had not been the effect of ſolution in a menſtruum, it muſt have been fluidity from heat and fuſion."

Earth.

This is the ſubſtance of all the evidence brought by Dr Hutton in ſupport of his doctrine, that moſt of the mineral ſubſtances with which the ſtrata are conjoined muſt have been produced by ſubterraneous heat, and not from any aqueous ſolution. Thus far he thinks it is perfectly concluſive, though not altogether ſo with regard to the formation of the ſtrata themſelves: but, in order to make it apply alſo to theſe, he next propoſes to give examples of ſtrata conſolidated without the introduction of foreign matter, merely by the ſoftening or fuſion of their own materials.

60
The doctrine of fuſion applied to the formation of the ſtrata.

61
Univerſal prevalence of the calcareous and ſiliceous ſtrata.

For this purpoſe he conſiders the calcareous and ſiliceous ſtrata, which are the two ſo much prevalent on the ſurface of the globe, that all others, according to him, may be conſidered as nothing: "for (ſays he) unleſs it be the bituminous or coal ſtrata, there is hardly any other which does not contain more or leſs of one or other of theſe two ſubſtances. If therefore it can be ſhown, that both of theſe two general ſtrata have been conſolidated by the ſimple fuſion of their ſubſtance, no deſideratum or doubt will remain with regard to the nature of that operation which has been tranſacted at great depths of the earth, places to which all acceſs is denied to mortal eyes.

"We are now to prove, 1. That thoſe ſtrata have been conſolidated by ſimple fuſion; and, 2. That this operation is univerſal in relation to the ſtrata of the earth, as having produced the various degrees of hardneſs or ſolidity in theſe bodies.

62
Conſolidation of a ſtratum from a fortuitous collection of hard bodies.

"I ſhall firſt remark, that a fortuitous collection of hard bodies, ſuch as gravel and ſand, can only touch in points, and cannot while in that hard ſtate be made to correſpond ſo preciſely to each other's ſhape as to conſolidate the maſs. But if theſe hard bodies ſhould be ſoftened in their ſubſtance, or brought into a certain degree of fuſion, they might be adapted mutually to each other; and thus conſolidate the open ſtructure of the maſs. Therefore, to prove the preſent point, we have but to exhibit ſpecimens of ſiliceous and calcareous ſtrata which have been evidently conſolidated in this manner. Of the firſt kind great varieties occur in this country. They are the conſolidated ſtrata of gravel and ſand, often containing abundance of feldtſpar, and thus graduating into granite; a body, in this reſpect, perfectly ſimilar to the more regular ſtrata which we now examine. The ſecond kind again are leſs common, unleſs we conſider the ſhells and coralline bodies of our limeſtones as exhibiting the ſame example, which indeed they do. But I have a ſpecimen of marble from Spain which will afford the moſt ſatisfactory evidence of the fact in queſtion. This Spaniſh marble may be conſidered as a ſpecies of pudding-ſtone; a ſpecies of marble which, from Mr Bowles's Natural Hiſtory, appears to be very common in Spain. The gravel of which this marble is compoſed conſiſts of fragments of other marbles of different kinds. Among theſe are different ſpecies of zeolites, marble, ſome ſhell marbles, and ſome compoſed of a chalky ſubſtance, or of undiſtinguiſhable parts. But it appears that all theſe different marbles had been conſolidated or made hard, then broken into fragments, rolled and worn by attrition; and thus collected together, along with ſome ſand or ſmall ſiliceous bodies,

63
Spaniſh marble deſcribed.

into one maſs. Laſtly, this compound body is conſolidated in ſuch a manner as to give the moſt diſtinct evidence that this had been executed by the heat of ſimple fuſion.

64
Proof of this having been in a ſtate of fuſion.

“ The proof is, that, beſides the general conformation of thoſe hard bodies, ſo as to be perfectly adapted to each other's ſhape, there is in ſome places a mutual indentation, which reſembles perfectly the junction of the different bones of the cranium ; and which muſt neceſſarily have required a mixture of thoſe bodies while in a ſoft or fluid ſtate.

“ This appearance of indentation is by no means ſingular or limited to one particular ſpecimen. I have ſeveral ſpecimens of different marbles, in which fine examples of this ſpecies of mixture may be perceived. But in this particular caſe of the Spaniſh pudding-ſtone, where the mutual indentation is made between two pieces of hard ſtone worn round by attrition, the ſoftening or fuſion of theſe two bodies is not ſimply rendered probable, but demonſtrated.

“ Having thus proved, that thoſe ſtrata had been conſolidated by ſimple fuſion, as propoſed, we now proceed to ſhow, that this mineral operation had been not only general but univerſal, in conſolidating our earth in all the various degrees, from looſe and incoherent ſhells and ſand to the moſt ſolid bodies of the ſiliceous and calcareous ſubſtances.

65
The ſame doctrine exemplified in chalk.

“ To examplify this in the various collections and mixtures of ſands, gravels, ſhells, and corals, were endleſs and ſuperfluous. We ſhall only take for an example one ſimple homogeneous body, in order to exhibit it in the various degrees of conſolidation, from the ſtate of ſimple incoherent earth to that of the moſt ſolid marble. The ſubſtance meant is chalk, naturally a ſoft calcareous earth, but which may be found conſolidated in every different degree.

66
Account of a ridge of indurated chalk running thro' the iſle of Wight.

“ Through the middle of the iſle of Wight there runs a ridge of hills of indurated chalk. This ridge runs from the iſle of Wight directly weſt into Dorſetſhire, and goes by Corfcaſtle towards Dorcheſter, perhaps beyond that place. The ſea has broke through this ridge at the weſt end of the iſle of Wight, where columns of the indurated chalk remain, called the *Needles* ; the ſame being found on the oppoſite ſhore in Dorſetſhire. In this field of chalk we find every gradation of this ſoft earthy ſubſtance to the moſt conſolidated body of this indurated ridge, which is not ſolid marble, but which has loſt its chalky property, and acquired a kind of ſtony hardneſs.

67
Another in Ireland.

“ We have this cretaceous ſubſtance in its moſt indurated and conſolidated ſtate in the kingdom of Ireland, not far from the Giant's Cauſeway ; and it affords the moſt perfect evidence of this body having been once a maſs of chalk, which is now a body of ſolid marble. Thus, if it is by means of fuſion that the ſtrata of the earth have in many places been conſolidated, we muſt conclude that all the degrees of conſolidation, which are indefinite, have been brought about by the ſame means.

68
Granite alſo conſolidated by fuſion.

“ It may, however, ſtill be alleged, that there is a great part of the ſolid maſs of this earth not properly comprehended among thoſe bodies which have been thus proved to be conſolidated by means of fuſion. This is granite ; a maſs which is not generally ſtratified, and which being a body perfectly ſolid, and forming ſome parts in the ſtructure of this earth, deſerves to be conſidered. The nature of the granite is too intricate a ſubject to be here conſidered : we ſhall therefore only now take notice of one ſpecies ; and if this appears to have been once in a ſtate of fuſion, we muſt conclude that all the reſt have been ſo too. The ſpecies in queſtion comes from Portſoy, on the road to Huntley ; and is partly a porphyry and partly a granite. The ſingularity of it, however, conſiſts not in the nature or proportions of its conſtituent parts, but in the uniformity of the ſparry ground, and the regular ſhape of the quartz mixture. This ſiliceous ſubſtance, viewed in one direction, or longitudinally, may be conſidered as columnar, priſmatical, or continued in lines running nearly parallel. Theſe columnar bodies of quartz are beautifully impreſſed with a figure on the ſides, where they are in contact with the ſpar. This figure is that of furrows or channels, which are perfectly parallel, and run acroſs the longitudinal direction of the quartz. This ſtriated figure is only ſeen when, by fracture, the quartz is ſeparated from the contiguous ſpar. But what is more particularly to be noticed is, that the tranſverſe ſection of thoſe longitudinal bodies not only have ſeparately the forms of certain typographical characters, but collectively give the regular linear appearance of types ſet in writing.

69
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“ It is evident from the inſpection of this foſſil, that the ſparry and ſiliceous ſubſtances had been mixed together in a fluid ſtate ; and that the cryſtallization of the ſparry ſubſtance, which had been rhombic, had determined the regular ſtructure of the quartz, at leaſt in ſome directions. Thus the ſiliceous ſubſtance is to be conſidered as included in the ſpar, and as figured according to the laws of cryſtallization proper to the ſparry ground ; but the ſpar is alſo to be found included in the quartz. Now it is not poſſible to conceive any other way in which theſe two ſubſtances, quartz and feldt-ſpar, could be thus concreted, except by congelation from a fluid ſtate, in which they had been mixed.”

7
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Our author having at length finiſhed his arguments on the formation of the ſtrata, draws the following general concluſion. “ If it be by means of heat and fuſion that ſtrata have been conſolidated, then, in proportion to the degree of conſolidation they have undergone from their original ſtate, they ſhould, *cæteris paribus*, abound with more ſeparations in their maſs. But this concluſion is not found conſiſtent with appearances. A ſtratum of ſand-ſtone does not abound ſo much with cutters or veins as a ſimilar ſtratum of marble, or even a ſimilar ſtratum of ſand-ſtone that is more conſolidated. In proportion therefore as ſtrata have been conſolidated, they are in general interſected with veins and cutters ; and in proportion as ſtrata are deep in their perpendicular ſection, the veins are wide, and placed at greater diſtances. In like manner, when ſtrata are thin, the veins are many, but proportionally narrow.

7
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“ It is thus upon chemical principles to be demonſtrated, that all the ſolid ſtrata of the globe have been condenſed by means of heat and hardened from a ſtate of fuſion. But this propoſition is equally to be maintained from propoſitions that are mechanical. The ſtrata of the globe, beſides being formed of earths, are compoſed of gravel, ſand, and fragments of hard bodies ;

dies; all of which may be conſidered as in their nature ſimple: but theſe ſtrata are alſo found compoſed of bodies which are not ſimple, but are fragments of former ſtrata which had been conſolidated, and afterwards were broken and worn by attrition ſo as to make gravel. Strata compoſed in this manner have been again conſolidated; and now the queſtion is, By what means?

“ If ſtrata compoſed of ſuch various bodies had been conſolidated, by any manner of concretion, from the fluidity of a diſſolution, the hard and ſolid bodies muſt be found in their entire ſtate, while the interſtices between thoſe conſtituent parts of the ſtratum are filled up. No partial fracture can be conceived as introduced into the middle of a ſolid maſs of hard matter without having been communicated from the ſurrounding parts. But ſuch partial ſeparations are found in the middle of thoſe hard and ſolid maſſes; therefore this compound body muſt have been conſolidated by other means than that of concretion from a ſtate of ſolution.

“ The Spaniſh marble already deſcribed, as well as many conſolidated ſtrata of ſiliceous gravel, afford the cleareſt evidence of this fact. Theſe hard bodies are perfectly united together in forming the moſt ſolid maſs; the contiguous parts of ſome of the rounded fragments are interlaced together, as has already been obſerved; and there are partial ſhrinkings of the maſs forming veins traverſing ſeveral fragments, but perfectly filled with the ſparry ſubſtance of the maſs, and ſometimes with parts of the ſtone diſtinctly floating on the tranſparent body of the ſpar. Now there is not in nature any known power, beſides heat and fuſion, by which theſe effects might be produced. But ſuch effects are general to all conſolidated maſſes, although not always ſo well illuſtrated in a cabinet ſpecimen.”

Thus the formation of the ſtrata is ſuppoſed to be fully diſcuſſed: after which our author goes on to conſider the means by which they have been elevated from the bottom of the ocean; for he looks upon it as an undoubted fact, that the higheſt points of our land have been for ages at the bottom of the ocean. “ It is a truth unqueſtionable (ſays he), that what had been originally at the bottom of the ſea, is at preſent the higheſt of our land. In explaining this appearance, therefore, no other alternative is left, but either to ſuppoſe ſtrata elevated by the power of heat above the level of the preſent ſea, or the ſurface of the ocean reduced many miles below the height at which it had ſubſiſted during the collection and induration of the land which we inhabit. Now if, on the one hand, we are to ſuppoſe no general power of ſubterraneous fire or heat, we leave to our theory no means for the retreat of the ſea or the lowering of its ſurface. If, on the other, we are to allow the general power of ſubterraneous heat, we cannot have much difficulty in ſuppoſing either the ſurface of the ſea to have ſubſided, or the bottom of the ocean in certain parts to have been raiſed by a ſubterranean power above the level of its ſurface, according as appearances ſhall be found to require the one or the other of theſe concluſions.

“ The ſtrata formed at the bottom of the ocean are neceſſarily horizontal in their poſition, or nearly ſo; and continuous in their horizontal direction and extent. They may change, and gradually aſſume the nature of each other ſo far as concerns the materials of which they are formed; but there cannot be any ſudden change, fracture, or diſplacement naturally in the body of a ſtratum. But if theſe ſtrata are cemented by the heat of fuſion, and erected with an expanſive force acting below, we may expect to find every ſpecies of fracture, diſlocation, and contortion in thoſe bodies, and every degree of departure from a horizontal towards a vertical poſition. The ſtrata of the globe are actually found in every poſſible poſition: for from horizontal, they are frequently found vertical; from continuous, they are broken and ſeparated in every poſſible direction; and from a plane, they are bent and doubled. It is impoſſible they could have been formed by the known laws of nature in their preſent ſtate and poſition. And here the apparent irregularity and diſorder of the mineral regions are as inſtructive, with regard to what had been tranſacted in a former period of time, as the order and regularity of theſe ſame regions are concluſive in relation to the place in which a former ſtate of things had produced that which, in its changed ſtate, we now perceive.

75
Strata found broken and disjoined in every poſſible poſition.

76
Have been raiſed by the force of fire.

“ We are now to conclude, that the land on which we dwell had been elevated from a lower ſituation by the ſame agent which had been employed in conſolidating the ſtrata, in giving them ſtability, and preparing them for the purpoſe of the living world. This agent is matter actuated by extreme heat, and expanded with amazing force. If this has been the caſe, it will be reaſonable to expect that ſome of the expanded matter might be found condenſed in the bodies which have been heated by that igneous vapour, and that matter foreign to the ſtrata may have been thus introduced into the fractures and ſeparations of thoſe indurated maſſes. We have but to open our eyes to be convinced of this truth. Look into the ſources of our mineral treaſures; aſk the miner from whence has come the metal into his vein? Not from the earth or air above; not from the ſtrata which the vein traverſes. There is but one place from whence theſe minerals may have come; and that is, the bowels of the earth; the place of power and expanſion; the place from whence muſt have proceeded that intenſe heat by which looſe materials have been conſolidated into rocks, as well as that enormous force by which the regular ſtrata have been broken and diſplaced.”

77
Proved from the inſpection of mines.

78
A great mechanical power requiſite to fill the veins with the matter they contain.

Our author is of opinion, that this action of heat is likewiſe evident from an inſpection of the materials with which the veins are filled, as well as their various fractures and irregularities; and informs us, that ſome great mechanical power muſt have been employed in filling theſe veins, as well as that neceſſarily employed in making the firſt fracture and divulſion. The ſucceſſive irruptions of fluid ſubſtances into the veins, he ſays, is *demonſtrable* from the mere inſpection of the veins and their contents, it being very common to ſee three ſucceſſive ſeries of theſe operations; “ all which may be perceived in a ſmall fragment of a ſtone, which a man of ſcience may examine in his cloſet, often better than by deſcending to the mine where all the examples are found on a large ſcale.”

79
Succeſſive irruptions of fluid matter into them.

Theſe fiery operations, he contends, are not to be accounted any way accidental, but as entirely natural to the globe, and remain at this day with undiminiſhed force: and of this he brings a proof from the eruptions of mount Ætna, informing us, that he has in his poſſeſſion a table of Sicilian jaſper, which evidently ſhows that this calcareous ſtone had flowed and been in ſuch a ſtate of fuſion as lava is.

80
Sicilian jaſper once in a ſtate of fuſion.

81
Heat of volcanoes the renovating power of the earth.

This ſubterraneous heat manifeſted in the burning mountains is the renovating power which the earth poſſeſſes within itſelf, and which prevents it from coming to an end by reaſon of the perpetual waſte taken notice of n° 22. "Volcanoes (ſays he) are natural to the globe as general operations; but we are not to conſider nature as having a burning mountain for an end in her intention, or as a principal purpoſe in the general ſyſtem of this world. The end of nature in placing an internal fire or power of heat, and a force of irreſiſtible expanſion in the body of this earth, is to conſolidate the ſediment collected at the bottom of the ſea, and to form thereof a maſs of permanent land above the level of the ocean, for the purpoſe of maintaining plants and animals. The power appointed for this purpoſe is, as on all other occaſions where the operation is important, and where there is any danger of a ſhortcoming, wiſely provided in abundance; and there are contrived means for diſpoſing of the redundancy. Theſe, in the preſent caſe, are our volcanoes.

82
Volcanoes to be conſidered as ſpiracles to the ſubterraneous heat.

"A volcano is not made on purpoſe to frighten ſuperſtitious people into fits of piety and devotion, nor to overwhelm devoted cities with deſtruction: A volcano ſhould be conſidered as a ſpiracle to the ſubterraneous furnace, in order to prevent the unneceſſary elevation of land and fatal effects of earthquakes; and we may reſt aſſured, that they in general wiſely anſwer the end of their intention, without being in themſelves an end for which nature had exerted ſuch amazing power and contrivance."

83
Are only proper for elevating land from the bottom of the ſea.

The Doctor then goes on to ſhow, that volcanoes are not proper for elevating land, unleſs placed at the bottom of the ſea, where the contact of the water tends to cloſe the orifice, and to accumulate matter upon the weakeſt part. An inſtance of this was given in the year 1707, when the burning iſland aroſe in the Mediterranean; and he confirms his theory by the great number of melted matters which are every where to be found in the ſtrata, even of countries where no volcanoes exiſt at preſent. Examples are brought from the dykes of whin-ſtone, as they are called in this country, and which he ſuppoſes to have been once in a ſtate of fuſion.

84
Whin-ſtone ſuppoſed to have been in a ſtate of fuſion.

85
Difference between erupted and unerupted lavas.

In order to avoid an objection which might here ariſe from the difference betwixt the appearance of our whinſtone and the lavas of volcanoes, our author makes a diſtinction between ſuch as have been erupted at the moment of exploſion, and thoſe which had been melted under a vaſt compreſſion of weighty materials, and at laſt expoſed to the air after the lpaſe of a number of ages. "In the erupted lavas, thoſe ſubſtances which are ſubject to calcine and vitrify in our fires, ſuffer ſimilar changes when delivered from a compreſſion which had rendered them fixed, though in an extremely heated ſtate. Thus a lava in which there is much calcareous ſpar, when it comes to be expoſed to the atmoſphere, or delivered from the compreſſing force of its confinement, effervesces by the exploſion of its fixed air; the calcareous earth at the ſame time vitrifying with the other ſubſtances. Hence ſuch violent ebullition in volcanoes, and hence the emiſſion of ſo much pumice ſtone and aſhes which are of the ſame nature. In the body of our whinſtone, on the contrary, there is no mark of calcination or vitrification. We frequently find in it much calcareous ſpar, or the *terra calcarea aerata*, which had been in a melted ſtate by heat, and had been cryſtallized by congelation into a ſparry form. This is the cauſe of the differences between the erupted lavas and our whinſtone, toadſtone, and the Swediſh trap; which may be called *ſubterranean lavas*."

86
Ebullition in volcanoes owing to the extrication of fixed air.

87
Comp
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88
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metal

All this time our author ſeems to have excluded from his ſyſtem every idea of accounting for the origin of metals; though this would ſeem to be no leſs neceſſary than to account for that of whinſtone. At laſt, however, we are informed that there are peculiar productions in the mineral kingdom which are rare, as being found only in few places; and of theſe he enumerates the diamond of the eaſt, the platina of the weſt, and the tin of Cornwal, Germany, and Sumatra. "But all theſe ſubſtances (gold itſelf not excepted)," ſays he, "are to be conſidered as the vapours of the mineral regions condenſed occaſionally in the crevices of the land."

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The laſt part of our author's diſſertation contains the ſyſtem of decay and renovation obſerved in the earth. In this having again obſerved what had been already repeated over and over, that the land we ſee at preſent had been formed at the bottom of the ſea, he proceeds to inform us, that, "at a groſs computation, there may perhaps be a fourth part of our ſolid land which is compoſed from the matter that had belonged to theſe animals. Now what a multitude of living creatures, what a quantity of animal economy, muſt have been required, for producing a body of calcareous matter which is interſperſed throughout all the land of the globe, and which certainly forms a very conſiderable part of the maſs! Therefore, in knowing how theſe animals had lived, or with what they had been fed, we ſhall have learned a moſt intereſting part of the hiſtory of the earth; a part which it is neceſſary to have aſcertained, in order to ſee the former operations of the globe, while preparing the materials of the preſent land."

9
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ſcribed.

Before entering upon this ſubject, however, he ſtill thinks it neceſſary to conſider ſome other of the component parts of the ſtrata of our preſent earth. Theſe are gravel, ſand, and clay. Gravel, he tells us, is no other than ſtones worn round by their attrition in water; and finding them in the compoſition of our land, we muſt conclude, that in the former earth there had been operations of wind and water ſimilar to thoſe which we behold at preſent; and by which new gravel is continually prepared, as well as old gravel conſumed or diminiſhed by attrition upon our ſhores. Sand is no other than ſmall particles of hard and ſolid bodies worn round by attrition. Clay is a mixture of different earths or hard ſubſtances in an impalpable ſtate; and theſe ſubſtances are chiefly the ſiliceous and aluminous earths. Others are occaſionally mixed in clays; or perhaps always to be found in ſome ſmall portion. But the great quantity of ſiliceous, argillaceous, and other compound ſubſtances, in form of earth or other impalpable ſediment, correſponds perfectly with that quantity of theſe ſame ſubſtances which muſt have been prepared in the formation of ſo much gravel and ſand, by the attrition of theſe bodies in the moving waters.

From theſe conſiderations our author tells us, that we have reaſon to conclude there had been in the former earth ſuch operation as we ſee at preſent; and likewiſe that it had been compoſed of ſimilar materials. The animals which had formerly exiſted, alſo appear by their remains to have been ſimilar to what they are now; and it is alſo probable that their food had been derived from the ſame origin, viz. vegetables. There muſt therefore have exiſted in the former earth a world of vegetables, as well as a world of animals and an ocean. The exiſtence of theſe he determines from the many ſpecimens of foſſil wood and petrified plants to be met with; and its profuſion he thinks is evidenced from the quantities of mineral coal: of which he ſays, that "nothing can be more certain than that all the coaly or bituminous ſtrata have had their origin from the ſubſtance of vegetable bodies that grew upon the land."

Laſtly, when he comes to ſpeak of the actual diminution of the earth we at preſent inhabit, he proceeds in the following manner: "Our land has two extremities; the tops of the mountains on one hand, and the ſea-ſhore on the other. It is the intermediate ſpace between theſe two that form the habitation of plants and animals. While there is a ſea, ſhore, and a high ground, there is that which is required in the ſyſtem of the world; take theſe away, and there would remain an aqueous globe, in which the world would periſh. But, in the natural operations of the world, the land is periſhing continually; and this is what we now want to underſtand.

"Upon the one extremity of our land there is no increaſe, nor any occaſion of mineral ſubſtance. That place is the mountain top, on which nothing is obſerved but continual decay. The fragments of the mountain are removed in a gradual ſucceſſion from the higheſt ſtation to the loweſt. Being arrived at the ſhore, and having entered the dominion of the waves in which they find perpetual agitation, theſe hard fragments, which had eluded the reſolving powers natural to the ſurface of the earth, are incapable of reſiſting the powers here employed for the deſtruction of the land. By the attrition of one hard body upon another, the moving ſtones and rocky ſhores are mutually impaired; and that ſolid maſs, which of itſelf had potential ſtability againſt the violence of the waves, affords the inſtruments of its own deſtruction, and thus gives occaſion to its actual inſtability."

Having thus deſcribed very particularly the means by which the deſtruction of the preſent earth is going on, it is natural to inquire what progreſs has been made in the work. But in this neither ancient nor modern hiſtory give any aſſiſtance. The ſtrait between Italy and Sicily he confeſſes to be no wider; the iſthmus of Corinth to be no narrower; nor the rock on which the famous tower of Pharos was erected, either larger or ſmaller than before. The Palus Mæotis in the time of Polybius appeared to be very near filling up, as that hiſtorian informs us; and ſo it continues to appear at this day, without any apparent progreſs having been made in it. In ſhort, the whole of our author's reſearches can produce nothing more than the loſs of a ſmall iſland in the mouth of the harbour of New Carthage, which, Polybius ſays, exiſted in his time; and for which there is now only a rock under water. Our author therefore is obliged at laſt to own, that the quantity of decay in the rocks he ſpeaks of, has either been too ſmall for human obſervation, or, which is more probable, that no accurate meaſurement of the ſubject by which this quantity of decreaſe might be aſcertained had been taken and recorded. "To ſum up the argument, therefore (ſays he), we are certain, that all the coaſts of the preſent continents are waſted by the ſea, and conſtantly wearing away upon the whole; but this operation is ſo extremely ſlow, that we cannot find a meaſure of the quantity in order to form an eſtimate. Therefore the preſent continents of the earth, which we conſider as in a ſtate of perfection, would, in the natural operations of the globe, require a ſpace indefinite for their deſtruction. But in order to produce the preſent continents, the deſtruction of a former vegetable world was neceſſary; conſequently the production of our preſent continents muſt have required a time which is indefinite. In like manner, if the former continents were of the ſame nature with the preſent, it muſt have required another ſpace of time, which is alſo indefinite, before they had come to their perfection as a vegetable world.

96
Immenſe ſpace of time required for the deſtruction and reproduction of the dry land.

97
Of the manner of their diſſolution and production.

"It is neceſſary, however, that the preſent land ſhould be worn away and waſted exactly in proportion as new land ſhall appear; or converſely, that an equal proportion of new land ſhould always be produced as the old is made to diſappear. It is only required, that at all times there ſhould be a juſt proportion of land and water upon the ſurface of the globe, for the purpoſe of a habitable world. Neither is it required, in the actual ſyſtem of this earth, that every part of the land ſhould be diſſolved in its ſtructure, and worn away by attrition, ſo as to be floated in the ſea. Parts of the land may often ſink in a body below the level of the ſea, and parts again may be reſtored, without waiting for the general circulation of land and water; which proceeds with all the certainty of nature, but which advances with an imperceptible progreſſion. Many ſuch apparent irregularities may appear without the leaſt infringement on the general ſyſtem. That ſyſtem is comprehended in the preparation of future land at the bottom of the ocean, from thoſe materials which the diſſolution and attrition of the preſent land may have provided, and from thoſe which the natural operations of the ſea afford.

"We have been now ſuppoſing, that the beginning of our preſent earth had been laid in the bottom of the ocean at the completion of the former land; but this was only for the ſake of diſtinctneſs. The juſt view is this, that when the former land of this globe had been complete, ſo as to begin to waſte and be impaired by the encroachment of the ſea, the preſent land began to appear above the ſurface of the ocean. In this manner we ſuppoſe a due proportion of land and water to be always preſerved upon the ſurface of the globe for the purpoſe of a habitable world, ſuch as we poſſeſs. We thus alſo allow time and opportunity for the tranſlation of animals and plants to occupy the earth. But if the earth on which we live began to appear on the ocean at the time when the laſt began to be reſolved, it could not be from the ma-

98
Preſent earth conſtructed from the materials of the third before it.

terials of the continent immediately preceding this which we examine, that the preſent earth had been conſtructed: for the bottom of the ocean muſt have been filled with materials before land could be made to appear above its ſurface.—Let us ſuppoſe, that the continent which is to ſucceed our land is at preſent beginning to appear above the water in the middle of the Pacific Ocean; it muſt be evident, that the materials of this great body, which is formed, and ready to be brought forth, muſt have been collected from the deſtruction of an earth which does not now appear. Conſequently in this true ſtatement of the caſe, there is neceſſarily required the deſtruction of an animal and vegetable earth prior to the former land; and the materials of that earth which is firſt in our account, muſt have been collected at the bottom of the ocean, and begun to be concocted for the production of the preſent earth, when the land immediately preceding the preſent had arrived at its full perfection. This, however, alters nothing with regard to the nature of thoſe operations of the globe; the ſyſtem is ſtill the ſame. It only protracts the indefinite ſpace of time in its exiſtence, while it gives us a view of another diſtinct period of the living world; that is to ſay, the world which we inhabit is compoſed of the materials, not of that which was the immediate predeceſſor of the preſent, but of the earth which, in aſcending from the preſent, we conſider as the third, and which had preceded the land that was above the ſurface of the ſea while our preſent land was yet beneath the water of the ocean. Here are three diſtinct ſucceſſive periods of exiſtence; and each of them is, in our meaſurement of time, a thing of indefinite duration.

99
Eternity of the world the final reſult of this theory.

We have now got to the end of our reaſoning; we have no data further to conclude immediately from that which actually is; but we have got enough. If the ſucceſſion of worlds is eſtabliſhed in the ſyſtem of nature, it is in vain to look for any thing higher in the origin of the earth. The reſult therefore of our preſent inquiry is, that we find no veſtige of a beginning, no proſpect of an end."

100
Whitehurſt's theory.

VI. Though the theory of which we have now given ſuch a large abſtract is the moſt laboured and complete that hath yet appeared, it is ſtill neceſſary to take notice of ſome other attempts, though perhaps leſs calculated to draw the attention of the public than that of Dr Hutton. One of theſe is by Mr Whitehurſt; of which the following is the moſt material part of an abſtract given by himſelf at the end of his work.

101
The globe originally in a fluid ſtate.

"1. The globe we now inhabit was originally in a ſtate of fluidity; and that not owing to any diſſolvent principle or ſubſequent ſolution, but to the firſt aſſemblage of its component parts. Whence it is preſumed, that the earth had a beginning, and has not exiſted from eternity, as ſome have imagined; though the preciſe number of ages it has exiſted have not yet been actually determined."

102
Proved from its ſpheroidal figure.

The proof given by our author of this original fluidity of the earth reſts entirely upon its oblate ſpheroidal form; which a fluid globe may eaſily be ſuppoſed to aſſume, though we cannot conceive how a ſolid one ſhould do ſo.

103
Its parts blended together into a ſoft pulp.

2. "The fluidity of the earth, and the infinite diviſibility of matter, evidently ſhow, that the component parts of air, earth, water, &c. were uniformly blended together, none being heavier or lighter than another; whereby they compoſed an uniform maſs or pulp, of equal conſiſtence in every part, from its ſurface to its centre: conſequently the new formed globe was unfit for animal or vegetable life; and therefore it would ſeem extremely abſurd to ſuppoſe that either the one or the other were created during the chaotic ſtate of the earth, or prior to its being formed into an habitable world: therefore the preſumption is great, that mankind were not created till the earth was become ſuitable to the nature of their exiſtence."

104
Proved from th
ſolution
metal i
acids, &

The proof of this poſition is laid down in the following manner. "It is a truth univerſally known, that the component parts of the moſt denſe bodies become ſuſpended in whatever menſtrua they are diſſolved; as for inſtance, the particles of gold in aqua-regia, ſilver in aquafortis, ſalts in water, and water in air. Nay, we may likewiſe add, that the component parts of mercury, in the act of diſtillation, become ſuſpended in air, notwithſtanding the ſpecific gravity of the former is to that of the latter as 11,000 to 1 nearly. Such, therefore, are the conſequences ariſing from the infinite diviſibility of matter, none being heavier or lighter than another when thus reduced to their original elementary principles."

105
Parts of
chaos en
dowed w
various
traction:

3. "The component parts of the chaos were heterogeneous, or endowed with peculiar laws of *elective attraction*; whereby ſimilar bodies are diſpoſed to unite and form ſelect bodies of various denominations, as air, water, earth, &c.: by means of theſe principles the chaos was progreſſively formed into an habitable world.

106
How the
ſeparatio
of its co
ponent
parts too
place.

"But the firſt operation which preſents itſelf to our conſideration is the oblate ſpheroidal figure of the earth, acquired from its diurnal rotation, and the laws of gravity, fluidity, and centrifugal force; which was no ſooner completed, than the component parts began to act more freely, according to their affinities: hence the particles of air united to thoſe of air, thoſe of water to water, and thoſe of earth to earth; and with their union commenced their ſpecific gravities, and deſtroyed that uniform ſuſpenſion which had hitherto prevailed throughout the chaotic maſs. Thus commenced the ſeparation of the component parts; for thoſe of the greateſt denſity began their approach toward the centre of gravity; and thoſe of the greateſt levity aſcended towards the ſurface: therefore, as air is nearly 800 times lighter than water, the preſumption is great, that the former was ſooner freed from the general maſs than the latter, and formed a kind of muddy impure atmoſphere, ſurrounding the newly formed globe. Water, being next in levity, ſucceeded the air, and univerſally encompaſſed the earth in one vaſt ocean. In proceſs of time theſe elements became perfectly pure and fit for animal life.

107
Iſlands
formed b
the attra
tion of t
ſun and
moon.

4. "The component parts of the chaos being thus progreſſively ſeparated and formed into ſelect bodies, the following conſequences neceſſarily enſued; namely, as the ſun and moon were coeval with the chaos, the ſolids could not uniformly ſubſide from every part of the ſurface, and become equally covered by water; for as the ſeparation of the ſolids and fluids increaſed, ſo, in like manner, the tides increaſed, and removed the former from place to place without any order or regularity. Hence the ſea became unequally deep; and theſe inequalities daily increaſing, in proceſs of time dry land appeared, and divided the waters which had hitherto

hitherto prevailed univerſally over the earth. The primitive iſlands being thus formed, in proceſs of time became firm and dry, and fit for the reception of the animal and vegetable kingdoms.

5. "Such appears to have been the natural order and progreſſion of theſe things; conſequently, as the ſun was coeval with the earth, ſeveral days and nights muſt have preceded the ſun's firſt appearance in the heavens, or its becoming viſible on the fourth day, according to the ſcripture account.

6. "The atmoſphere, ſea, and land, being thus formed for the reception of the animal and vegetable kingdoms in ſucceſſive periods of time, we have now to conſider the order in which they were ſeverally created. Firſt, ſince it appears that the ocean became perfectly pure and fit for animal life before the primitive iſlands were formed, therefore we have endeavoured to prove from a ſeries of undeniable facts (A), that marine animals were firſt formed; and being extremely prolific, they increaſed and multiplied ſo exceedingly as to repleniſh the ſea from pole to pole. The ocean being thus ſtocked with inhabitants prior to the formation of the primitive iſlands, many of them became enveloped and buried in the mud by the continual action of the tides; particularly all the ſpecies of ſhell-fiſh, which are leaſt able to defend themſelves from ſuch interments. Therefore, ſince the remains of marine animals are imbedded at various depths in the earth, from one to that of ſeveral thouſand feet, and this in all parts of the world hitherto explored, they bear ſufficient teſtimony, that theſe marine bodies were thus entombed at ſucceſſive periods of time; and likewiſe that they were created prior to the primitive iſlands, and conſequently prior to any terreſtrial animals It may be needleſs further to obſerve, that theſe beds of marine ſhells plainly evince, that they were generated, lived, and died in the very beds wherein they are found, and were not brought from diſtant regions by a flood or floods of water, as ſome people have ſuppoſed; conſequently ſuch beds were originally the bottom of the ocean.

7. With regard to the mountains, and indeed the continents alſo, Mr Whitehurſt is of opinion, that they are the effects of ſubterraneous fire. His ſentiments on this ſubject, however, are ſomething ſingular; for he tells us, that "mountains and continents were not primary productions of nature, but of a very diſtant period of time from the creation of the world, when the ſtrata had acquired their greateſt degree of firmneſs and coheſion, and the teſtaceous matter had aſſumed a ſtony hardneſs."

Thus we have given a very particular account of all the theories of any note concerning the formation of the earth which have yet made their appearance. The deficiency of thoſe of Burnet, Woodward, Whiſton, and Buffon, muſt be exceedingly obvious even to the moſt ſuperficial reader. They all aſſume only the powers of attraction and repulſion as agents; without conſidering that theſe two powers, or indeed any other two with which we are acquainted, could only have compoſed matters nearly ſimilar to each other. If the original particles of matter are homogeneous, and endowed with ſimilar powers, all the matter we ſee ought to be homogeneous alſo. But this is far from being the caſe. Some parts of it we ſee are exceedingly hard, others proportionably ſoft. The parts of ſome bodies attract each other violently; thoſe of others have hardly any attraction for each other, but are ſeparable by the ſmalleſt force. And though it ſhould be granted that the powers of attraction and repulſion were originally different in different parts of matter, we have ſtill to explain by what means the ſimilar parts of matter found out each other in ſuch a chaos as the earth originally was. This ſeems an inſuperable difficulty in the ſyſtems of Drs Burnet and Woodward; and is equally, though leſs conſpicuouſly ſo, in thoſe of Whiſton and Buffon.

115
Deficiency of Mr Whiſton's theory;

Mr Whiſton's ſyſtem has another and very remarkable defect. He ſuppoſes the earth to have been originally a comet, and at a certain time to have become a planet: but he forgets to tell us by what means this comet was originally formed, or what kind of bodies the comets are. Yet certainly this theory of the comet was as neceſſary to his ſyſtem as the theory of the earth itſelf: for all the ſubſtances now exiſting on the earth muſt originally have exiſted in the comet; and if the natural powers were known which made a diſtinction between one ſubſtance and another in the comet, we would alſo know thoſe which diſtinguiſhed terreſtrial ſubſtances from one another. But though even this great deficiency ſhould be overlooked, the ſuppoſition of a chaos or original confuſion of any kind involves us in the greateſt difficulties. If the whole ſurface of the earth conſiſted of a chaos of melted matter, we cannot reaſonably think it would have appeared otherwiſe when cool than the lavas of burning mountains do juſt now; and this is a conſequence of his ſyſtem which Mr Whiſton ſeems to have entirely overlooked.

116
Of Mr Buffon's.

Mr Buffon's theory is liable to the ſame difficulties with the reſt. He places his chaos in the ſun; and therefore ought to have given a theory of the ſun before he gave one of the earth. It ought alſo to have been ſhown for what purpoſe the ſun was created when he had nothing to ſhine upon, or what probability there is that comets exiſted when there were no planets. His account of the formation of the planets by the ſtroke of a comet, is juſt within the verge of *poſſibility*; but his account of the formation of mountains by the motion of the winds and tides, is certainly inconſiſtent with the common principles of mechanics. Though it ſhould be granted, that water can diſſolve every terreſtrial ſubſtance when vitrified by a heat 10,000 times greater than our hotteſt furnaces, as the ſun muſt neceſſarily be; and though the water ſhould let fall this matter as a ſediment in what quantities and forms we think proper to imagine; it is impoſſible any of it could be thrown two or three miles above the ſurface of the water, in order to form thoſe high mountains which are to be met with in different parts of the world. It is indeed very plain, that though by the motion of the waters their ſediment might be collected in great heaps, it could never reach higher than their ſurface. The mountain,

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(A) Theſe proofs are afterwards conſidered, as here our author ſeems to be of the ſame opinion with Dr Hutton.

mountain, once formed, muſt then be for ever covered with water; for the ſediment would take up preciſely the ſame bulk when a mountain that it did when in a ſtate of diſſolution, and the water could never retire from it as he ſuppoſes. If the waters retired into vaſt ſubterraneous caverns, according to another of Mr Buffon's ſuppoſitions, they muſt have remained for ever in theſe caverns, from whence they could not have returned to effect thoſe wonderful changes he aſcribes to them. But what in the ſtrongeſt manner ſhows the fallacy of Mr Buffon's hypotheſis, is the analogy he draws between mountains on dry land and iſlands in the ſea. The iſlands, he ſays, are only the tops of great mountains in the ocean. If, therefore, the ocean had for a ſeries of many ages covered the preſent habitable part of the world, as our author ſuppoſes, we ſhould undoubtedly find many mountains upon the dry land, the tops of which had formerly been iſlands. But no ſuch thing is to be found. There is not on earth a mountain with a top broad and flat like the iſland of Great Britain or Ireland, or even like iſlands of much leſs conſideration.

117
A number of natural powers beſides attraction and repulſion proved to exiſt.

Theſe, and many other objections that will naturally occur to an attentive reader, ſhow the extreme difficulties under which the hypotheſis of Mr Buffon labours, as well as others. Theſe difficulties ariſe, in the firſt place, from their aſſuming too few natural powers. Though it is certain that the powers of attraction and repulſion exiſt in nature, it is no leſs certain that there are many others. One very remarkable power entirely different from thoſe of attraction and repulſion, may be called the power of *aſſimilation* or *tranſmutation*. By this, each animal, and each plant, changes the nutritious particles thrown into its ſtomach, or which it meets with in the earth, into a ſubſtance of its own peculiar kind. Thus, a ſtalk of wheat, by means of its roots, always aſſimilates the nutritious particles of the ground into that particular grain we call wheat, and no other. This power naturaliſts have not been able to explain on the principles of attraction and repulſion, or any others with which we are acquainted; and therefore it may juſtly be called one of the primary laws of this earth at leaſt, whether we underſtand the manner in which it operates or not.—Another power which ſeems to be diffuſed throughout this terraqueous globe, and common to all ſubſtances, water alone excepted, is that of multiplying themſelves, or producing others of the ſame ſpecies. With regard to plants and animals, this is exceedingly evident; but may be diſputed in the caſe of minerals. It is certain, however, that mines which have been exhauſted, will in time be again repleniſhed with ore; that ſpars and cryſtals, if broken or cut while their connection with the earth remains, will protrude a ſubſtance ſimilar to the reſt, as certainly as the wounded body of an animal will protrude fleſh of a kind ſimilar to what was taken away. The earth itſelf is capable of this multiplication. We ſee how it hath a tendency to aſcend, and cover ſtones, &c. which lie a long time on its ſurface; and thus does this element, ſeemingly the moſt ſluggiſh of all others, ſwallow up every thing that lies for ſome time undiſturbed upon it. Hence we now meet with many monuments of antiquity below ground, which formerly were undoubtedly above it. Yet we have no right from thence to conclude, that the height of the dry land above the water was greater at that time than what it is now. This multiplication of earth is chiefly owing to vegetation; which continually produces a new cruſt on the top, and thus tends to bury all ſuch matters as reſt upon the ſurface. This cruſt, however, does not produce a continual increaſe in the height of the dry land; for whatever quantity the vegetables add to the ſurface, they take from the under parts by the ſuction of their roots. Thus the ground becomes more porous, and the weight of ancient buildings, ſtones, &c. gradually forcing them downwards, they are at laſt buried under ground to a conſiderable depth.—Hence it is eaſy to account for the ſinking of the marine bodies that are to be found at different depths in the earth, even ſuppoſing them to have been left on its ſurface by the deluge. M. Buffon's objection, drawn from the great quantities of them, ſeems but very weak: for it is certain, that marine animals, both of the cruſtaceous and other kinds, are found in the ſea at this day in amazing quantities; and there is no bed of ſhells ſo large, that we can reaſonably think it *impoſſible* for all the animals to have exiſted in it at once.

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With regard to the ſtrata, it ſeems undeniable that they may be produced from natural cauſes. Clay will ſometimes be conſolidated into ſtone; flint, marble, and limeſtone, are all found to grow naturally in the earth; ſo that we cannot draw any concluſion from the order in which we now find them. Though we find a bed of ſhells, then, in the heart of a ſolid rock, this makes no difficulty in the theory of the earth; ſince we know that the rock hath by ſome natural cauſe been conſolidated around them. In fact, this is not ſo wonderful, as what is related by Mr Price in his Treatiſe of Minerals, Mines, &c. viz. That at the town of Redruth in Cornwall, "ſome labourers being put to clear and level the ſtreet for a pavement, they found a piece of hard ſtone in the ground, with abundance of common ſmall pins of braſs interſperſed in and throughout the ſtone, in ſuch manner and form, that all thoſe who ſaw it afterwards were convinced it was not done artificially, but that the ſtone was formed and produced by petrifaction, ſubſequent to the time the pins were dropped into the ground. Doctor Plot, in his Natural Hiſtory of Staffordſhire, ſays, that near Newcaſtle under Lyne, there was found a ſtone with a man's ſkull, teeth and all, incloſed in it."—From theſe and other facts in ſome meaſure ſimilar, this author concludes, that every earth or clay, in ſome places, may be converted into ſtone in proceſs of time, at ſuch a depth where it is undiſturbed by being never lacerated nor moleſted, and alſo where it abounds with an uncommon quantity of juices of a lapideſcent quality: but this property being extenuated or deſtroyed, the earthy ſtones may not improbably again return to their primitive clay. Thus we ſee ſome ſorts of ſtone, when dug out of the ground and expoſed to the air for a conſiderable time, do moulder again into earth, at leaſt in appearance; while others, of an earth-like quality, are indurated, and become more compact and durable by lying above ground."

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The theory laid down by Dr Hutton is of a different nature from the reſt; and as it has been ſuppoſed directly to militate againſt revelation, merits a very particular conſideration. The expreſſion, however, with which

which he concludes his diſſertation, that "we can find no veſtige of a beginning—no proſpect of an end," might be ſuppoſed to relate only to the deficiency of our underſtandings or mode of inquiry, had he throughout the whole courſe of his work given a ſingle hint of any *materials* from which the world was originally formed. In this he differs moſt eſſentially from the other theoriſts whom we have mentioned; for all of them ſuppoſe a chaos to have been originally created, from whence all the variety of ſubſtances we ſee at preſent have been formed. But as the Doctor makes no mention of any thing prior to a world nearly ſimilar to what we ſee juſt now, we muſt neceſſarily conclude that its eternity is a part of his creed. Now, that the world has not been eternal, may be proved from what he himſelf allows. Wherever we perceive a ſucceſſion, we know that there muſt of neceſſity have been a beginning: but, according to our author, there has been a ſucceſſion of worlds, by a kind of uncouth generation, ſimilar to what would happen to the human race if a man was to deſcend immediately from his grandmother. Proceeding in this way, therefore, we muſt at laſt arrive at one great-grandmother of earths, from whence all the reſt were deſcended; and of this one a theory was no leſs neceſſary than of any of her ſucceſſors. This theory would have been the more difficult, as his great element *cockle-ſhells* and *oyſters* would then have been abſent, and the materials from whence they were afterwards to be produced muſt have been ſought for.

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Another argument, which evidently ſhows not only that the world is not eternal, but that ſome other power beſides its own interfered with it originally, may be taken from the exiſtence of animals and vegetables; both of which our author allows to have had a place throughout all his worlds. We ſee at preſent, that animals proceed from animals, and vegetables from vegetables; but the time muſt have been, when an animal was produced without a parent, and a vegetable without a ſeed. At this time the world muſt have been influenced by a power different from any it poſſeſſes at preſent; for no ſuch power is now to be found in any part of the globe.

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Laſtly, the quantity of ſhells, great as it is, can by no means be reconciled with an eternal ſucceſſion of worlds, or even with three; for, according to him, we muſt have *three* in order to have *two* habitable ones; *viz.* one lying at the bottom of the ſea, another wearing away, and another beginning to emerge. Now he informs us, that only a fourth part of our land is compoſed of calcareous matter derived from marine animals*. But if one of the worlds has continued for a time *indefinite*, and conſequently another lain at the bottom of the ſea for an equal length of time, it muſt, inſtead of having a fourth part of its ſoil compoſed of calcareous matter at the time of its emergence, have been entirely compoſed of it, at leaſt if we can credit what is ſaid concerning the prolific nature of theſe animals. Mr Whitehurſt informs us, that "it is not uncommon to take away a bed of ſhell-fiſh ſeveral fathoms in thickneſs; and though the places where they are fiſhed for appear to be entirely exhauſted, yet in the enſuing year there ſhall be as many found in all theſe places as before." Such an amazing increaſe muſt, in a time *indefinite*, eſpecially if repeated for an indefinite number of times, have reduced the whole terraqueous globe to an heap of cockle-ſhells or other ſubſtances of that kind.

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Our author is equally unfortunate in the very firſt ſtep of his argument, where he ſays that the ſoil is only "the materials collected from the deſtruction of the ſolid land." He owns that all his earths produced vegetables; but theſe muſt have had a ſoil whereon to grow before the firſt world had time to be deſtroyed. We are therefore here in the ſame dilemma with regard to the ſoil that we were before with regard to the vegetables; and as we are obliged to own the interference of a Superior power to produce the firſt vegetable, ſo muſt we alſo have recourſe to the ſame power for the production of the ſoil on which it grew. All theſe conſiderations ought to have led the Doctor to a concluſion very different from that which he has drawn, and to have ſhowed him that the *beginning* of the world was occaſioned by a power which cannot poſſibly be inveſtigated, becauſe it lies without the bounds of Nature itſelf, and far beyond the reach of our faculties.

127
A ſupernatural power muſt have taken place in the original formation of vegetable ſoil.

This objection indeed militates invincibly againſt all theories of the earth which ſeek to derive its original from natural cauſes. The powers of attraction and repulſion we have already ſhown to be inſufficient; and though we ſhould add to them thoſe of fire and water, with all the train of ſolvents and precipitants which chemiſtry can afford, the deficiency will ſtill be as great. It is true, that by means of chemiſtry we can imitate many of the natural operations, provided we have the proper materials: But this is the capital defect in all our theories of the earth. Whence came vaſt quantities of argillaceous earth into one place, of ſiliceous earth into another, of the materials for iron, ſilver, gold, &c. into the places where they are now found? With Dr Hutton indeed the whole ſeems to be compoſed of two materials, *viz.* calcareous earth and flint. But before he could juſtify this aſſertion, he ought to have produced from theſe two materials, at leaſt a great number of the different ſubſtances with which the earth is repleniſhed. But inſtead of this, he has recourſe to natural productions, formed, as he ſays, by means which, in the hands of the beſt chemiſts, will prove inſufficient to produce any thing like them.

128
Origin of the earth cannot be accounted for from natural cauſes.

129
Too much attributed to calcareous earth and flint by Dr Hutton.

In his account of the origin of calcareous matter, he tells us, it is to be derived entirely from the ſhells of marine animals; but he forgets to inform us whence theſe animals got their ſhells. There muſt have been ſome ſource of calcareous matter from which the *firſt* oyſter (for we have already ſeen that they could not have exiſted from eternity) derived its ſhell, and that independent of any other marine animal. Now we ſee at this day an abundant ſource from whence the ſhells of all marine animals may be derived, *viz.* the waters of the ocean, which contain a great quantity of calcareous matter. If we inquire whence theſe waters have it, we may ſay they take it up from the earth, part with it again in the form of ſhells, corals, &c. rediſſolve it, and ſo on. But if we will ſtill inquire farther whence the earth itſelf had it, we muſt once more have recourſe to that unſearchable and ſupernatural power to which we aſcribed the origin of animals, vegetables, and the ſoil whereon they grow.

130
Calcareous matter proved to exiſt independent of marine animals.

It is the foundation of Dr Hutton's theory, and indeed

Earth.

131
Earth proved not to have remained long at the bottom of the ſea.

deed ſeems now to be a favourite doctrine of moſt theoriſts, that the earth we inhabit has once been at the bottom of the ſea; and it is thought to be a ſufficient proof of this, that ſuch vaſt quantities of marine ſhells are to be met with on dry land. Mr Whitehurſt, after giving a long account of theſe ſhells, infers, among other things, that the "beds of foſſil ſhells, which conſiſt of one ſpecies only, and are not natives of the climate where found, but of very diſtant regions of the earth, evidently ſhow that they were generated, and have lived and died in the very beds where found; and could not have been removed from their native climates by a flood or floods of water, with ſo much order as to form beds conſiſting only of one ſelect ſpecies; and therefore all ſuch beds muſt have been originally the bottom of the ocean."

132
Falſe mode of reaſoning adopted by many theoriſts.

On this mode of reaſoning, however, we muſt obſerve, that no hypotheſis can have a worſe foundation than when it is built confeſſedly on our own ignorance. We know not, for inſtance, how a bed of foſſile ſhells came into a certain place; therefore the whole world has been at the bottom of the ſea for many thouſand years, the climates have changed, or it has been eternal! Thus to unhinge the ſettled laws of nature for ſuch trivial purpoſes, is certainly the greateſt contradiction to true reaſoning that can be imagined. But it is not only from a negative argument of this kind that we may refute this hypotheſis; there is a much ſtronger one drawn from the marine productions themſelves. It is certain, that there are ſubſtances very different from ſhells of any kind, which grow up from the bottom of the ocean, and in time *indefinite* aſcend all the way to the ſurface, and there form iſlands. Theſe are the coral rocks ſo common and ſo dangerous in the South Sea, and of which many of the iſlands there are formed. Now, how comes it to paſs, that among all the marine monuments to be found on land we find no coral rocks growing there? The anſwer to this is obvious. The coral rocks require a vaſt length of time for their production, and are ſtrongly fixed to the place where they grow; they cannot therefore be removed over land by any ſudden flood or inundation, not even by a general deluge. Though it appears therefore, from the ſhells and other marine moveables, that what is now dry land has once been at the bottom of the ſea, yet it is equally evident from the deficiency of theſe rocks, that it has not remained ſo for any length of time; and therefore, though we ſhould by no means be able to explain all the appearances of foſſile ſhells, we are not to admit a ſuppoſition which, from the circumſtance juſt mentioned, cannot poſſibly be true.

133
The want of coral rocks on land ſhows that it has not been long at the bottom of the ſea.

134
Why every appearance of foſſil ſhells cannot be explained.

With regard to theſe ſhells, however, we muſt remark, that it is in vain to attempt the explanation of every appearance; nor can any ſuch thing be reaſonably deſired, even though we ſhould acknowledge the deluge to be the univerſal cauſe. We know not, nor can we have any conception of, what might be accompliſhed by the mere mechanical motion of the waters in this caſe. Every one who has had an opportunity of ſeeing the effects of a violent land-flood, will be ready to own that it has performed things which *à priori* he would not have thought it could have done. But how infinitely muſt theſe effects be exceeded by one vaſt deluge, in which not only the dry land was ſoftened by an inceſſant rain of ſix weeks, but the ſea roſe on all ſides, and poured in upon it with all the moveable contents which the waters carried along with them?

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Of the effects which the deluge certainly produced.

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That great numbers of ſhells already formed would be brought along with the waters of the ocean, is an aſſertion which can ſcarce be denied; and we ſhall be inclined to look upon this number as exceedingly great, if we conſider the way in which it is moſt probable that the deluge came on. This was by the iſſuing out of waters* from every pore of the earth and bottom of the ocean, as well as by their deſcent from the clouds. In conſequence of the former action, all the light bodies at the bottom of the ſea muſt have been turned topſy turvy, and carried up no one can tell how far; at the ſame time that by the progreſſive motion of the waters they were carried to an unknown length over the land, and there depoſited when the motion ceaſed.

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This circumſtance of itſelf will account for the appearance of vaſt numbers of ſhells and other marine productions on land; but there is another which muſt be taken along with it, and will undoubtedly add greatly to its force. The unfathomable depths of the ocean are not the proper habitations of fiſh; and they are only found on ſhoals, or near the ſea-coaſts. At the time of the deluge, therefore, great numbers of the marine animals muſt have exchanged their ancient habitations for thoſe where the water was more ſhallow; and of conſequence would have abounded on the tops of mountains and other elevated places. Whether thoſe animals whoſe exuviæ are moſt plentifully met with on land have any locomotive power when full-grown, is uncertain; but whether they have or not, they are certainly of ſuch minute ſizes when young, that they may be floated to any diſtance by water. Thus therefore any kind of ſhell-fiſh may have reached any place in the globe; and Mr Whitehurſt himſelf owns, that they can arrive to their full maturity in leſs than a year, as the beds which have been exhauſted one year are found to be repleniſhed the next. Now the flood, according to the Scripture account, continued long enough to allow time for their increaſe from ſpawn to their full ſize. It arrived at its full height in 40 days; and continued ſtationary for five months. It then began to decreaſe; but ſo gradually, that it was not till the firſt day of the tenth month that the tops of the mountains began to appear above the ſurface of the water; and it was not till towards the end of the eleventh that the tops of trees began to emerge. Here then we have time for beds of ſhell-fiſh to grow, live, and afterwards be left by the water; which in their mature ſtate they could not follow, and thus to die in the places where they were generated.

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Thus far we may ſafely argue with regard to the exiſtence of large beds of ſhells on the ſurface of the earth: and it has already been ſhown how the earth would naturally cover and ſwallow them up to a conſiderable depth. But to account for the great depths at which we find them ſometimes buried, ſeveral other things muſt be taken into conſideration. One is, that the earth, by the continual rains at the time of the deluge, as well as by the iſſuing of the waters every where through its ſubſtance, muſt have been exceedingly ſoft and eaſily penetrated. The helpleſs animals, there-

therefore, brought along with the ocean at its firſt irruption over land, would have been deep buried in the mud: and when we take into our account the preſſure of a column of water four miles deep, it is impoſſible to ſay what effects this cauſe might have produced. They might, beſides, have been accumulated in clefts of rocks, in hollows, valleys, and caves; and have been there conſolidated by petrifaction and the growth of calcareous matter over them. And that ſomething ſimilar to this actually happens, we are very certain: for Mr Whitehurſt informs us, that "the ſprings of Matlock-bath in Derbyſhire, though extremely pellucid and friendly to the human conſtitution, are nevertheleſs plentifully ſaturated with calcareous matter, which readily adheres to vegetables and other ſubſtances immerſed in their ſtreams; and thus, by a conſtant accretion, large maſſes of ſtone are gradually formed. The banks on which the bath-houſes ſtand, and likewiſe the buildings themſelves, are moſtly compoſed of ſuch materials."—Now, had theſe waters directed their courſe over a bed of ſhells, through a burying-place, or over a field of battle, it is evident that they would have incloſed a great number of ſhells, human and horſe bones, heads of lances, ſwords, or even the more modern weapons of guns and piſtols; which, to a curious naturaliſt, might have furniſhed an argument for the antiquity of theſe latter weapons. If therefore we ſee that bodies at this day may be ſo eaſily imbedded in ſtone, why ſhould we pretend to ſet bounds to the petrifactions which may have happened in the courſe of more than 4000 years? a period far beyond the reach of our moſt ancient hiſtories.

It is not meant, by what we have juſt now ſaid, to explain all the appearances of foſſil ſhells or bones from the deluge as a general cauſe. This cannot be done unleſs we knew all the circumſtances. The following facts, however, may be looked upon as authenticated. 1. That when the waters overwhelmed the land, great numbers of marine animals were carried along with it. 2. That during its continuance moſt of thoſe which have any locomotive power would chooſe rather to dwell over land than in places which had formerly been their reſidence. 3. That while the waters remained on the earth, all kinds of marine animals would breed over land in their natural way; and ſuch as could not follow the waters in their retreat, would be left to die on dry land, which muſt have been the caſe particularly with ſhell-fiſh. 4. Theſe impotent animals, which have little or no power of locomotion, would by the preſſure of a column of water four miles high be buried to depths unknown. 5. After the retreat of the waters, thoſe which had been lodged in hollows or clefts, or perhaps diffuſed through the ſubſtance of many ſoft ſtrata, might by ſome petrifying quality in the ſtratum be ſo conſolidated along with it as afterwards to form one entire rock. This is evident, not only from the example of the Matlock-ſprings, but more ſo from that of the pins found in the ſtone at Red-Ruth in Cornwal, from the petrified ſkull mentioned by Dr Plott, and many others; of which we ſhall mention the following from Mr Whitehurſt.—"The ſtrata of limeſtone in Derbyſhire, and in many other parts of England, abound with the exuviæ of marine animals, or the impreſſions of them in the ſolid ſubſtance of the ſtone; and we have likewiſe ſeveral inſtances related by authors of the bones of terreſtrial animals, and alſo of wood, having been found inveloped in ſtrata of ſtone. A complete human ſkeleton, with Britiſh beads, chains, iron-rings, braſs bits of bridles, were dug up in a ſtone-quarry near the Earl of Widdrington's ſeat at Blanknay in Lincolnſhire.—Human bones and armour, with Roman coin, fibulæ, &c. were found in a ſtone-pit in the park at Huſtanton in Norfolk, ſuppoſed to have been buried after a battle.—In the mountains of Canne, half a league from Meaſtrick, were found the remains of a crocodile well preſerved in a ſtratum of ſand-ſtone.—The remains of a crocodile were alſo found in a ſtratum of ſtone at Blenheim.—The beds of argillaceous ſtone, &c. incumbent on coal, alſo contain a great variety of figured foſſils repreſenting different parts of the vegetable creation."

142
The deluge may be ſuppoſed the general cauſe of foſſil animal ſubſtances.

From all theſe examples it is plain, that the lapideſcent power which the earth poſſeſſes is capable of incruſting bodies with ſtone to an unknown thickneſs. In whatever ſituation therefore we find thoſe foſſil bodies, we have no reaſon to ſay that the deluge is not ultimately the cauſe of their being there; becauſe its power in overſpreading the earth with them, in burying them in it, or forcing them into clefts and caverns, is altogether unknown: and before it is denied that the deluge could be the cauſe of ſuch appearances, it is neceſſary to ſhow all that it really *could* do, which is evidently impoſſible; ſo that here our ſpeculations muſt ultimately reſt.

143
Of foſſil human bones.

We ſhall only add one other fact which muſt certainly have taken place at the deluge. At that time the world is generally thought to have been very full of inhabitants. Theſe, as well as all the inferior animals, would naturally fly from the approaching danger. This would aſſemble them in great numbers in ſuch places as appeared to afford ſecurity; and here they would all periſh together. This will account for the vaſt heaps of bones found in certain parts of the world, as in the rock of Gibraltar, Dalmatia, &c. and the natural petrifactive power of the earth may account for their conſolidation. The ſlaughters which mankind have made of one another may indeed account for many of theſe appearances. When we read in hiſtory of 40,000, 50,000, or 100,000 men being killed in a battle, we never think of the ſpace their bones would occupy when thrown into a heap; nevertheleſs, we are aſſured that the bulk of theſe remains muſt be very great. Tamerlane, with an army of 800,000 men, filled up the harbour of Smyrna by cauſing each of his ſoldiers throw one ſtone into it; and when Marius defeated the Cimbri, the bones of the ſlain were ſo numerous, that they were uſed for a long time as fences for vineyards. Had theſe been collected into one heap, and afterwards conſolidated by petrifactive matter, they would undoubtedly have occupied a very conſiderable ſpace. What then muſt have been the caſe, when every man, nay every other terreſtrial creature, died at once? Taking all theſe things into conſideration, it muſt ſurpriſe us that the collections of foſſil bones are not more numerous than we find them.

Thus we ſee, there is on the one hand no reaſon for denying that the deluge has been the cauſe of all the foſſil appearances we perceive; and on the other, that there

144 Dr Hutton's account of the formation of the ſtrata conſidered.

145 His theory overthrown by an experiment of Bergman's.

there is the ſtrongeſt reaſon for denying that the land we inhabit has been for a length of time at the bottom of the ſea. Diſmiſſing therefore this part of Dr Hutton and Mr Whitehurſt's theories, we ſhall now proceed to conſider that of the former, where he inveſtigates the formation of the ſtrata. Theſe, he ſays, could not be formed by aqueous ſolution. That they could not be ſo originally, we readily grant; but that they have preſerved themſelves from decay, transformed themſelves into one another, and repaired their waſte by this means, is abſolutely certain. The Doctor indeed gives up his own argument; for he tells us, that "if flint can be produced by cryſtallization from water or any aqueous ſolution, then may his aſſertions concerning the conſolidation of the ſtrata be denied." But Mr Bergman aſſures us, that he actually did produce flint by allowing a quantity of fluor acid to ſtand for two years on ſome powdered quartz; and this is more than any chemiſt can pretend to do by the violent heat of fuſion, to which Dr Hutton has recourſe on all occaſions. We do not pretend, however, to ſay, that the different ſtrata of earth have been formed originally by aqueous ſolution. For this we muſt have recourſe to the power already mentioned, and for want of which neither Dr Hutton's theory nor any other can ſupport itſelf. But though the ſtrata were originally formed by Divine power, they are certainly preſerved, repaired, and changed by natural cauſes; of which aqueous ſolution is a principal, though not the only one.

146 Wood may be penetrated by flint in a ſtate of ſolution.

The ſaid experiment of Mr Bergman's entirely overthrows the Doctor's objection (n° 39.) relating to the penetration of wood by ſiliceous or flinty matter. It ſhows, that the matter in queſtion may be diſſolved, and in no very long time depoſited in its proper form; ſo that had Mr Bergman incloſed a bit of wood in his bottle which produced the flint, there is no reaſon to doubt that it would have been ſo penetrated by the ſiliceous matter as to be completely *flintified* (to uſe Dr Hutton's word) by the end of the two years.

147 Flints may thus grow in the heart of chalk.

148 Extreme abſurdity of ſuppoſing wood to be penetrated by melted flint.

The *impoſſibility* which our author talks of, of flinty ſubſtances being found inſulated in the midſt of beds of chalk, is likewiſe thus removed. But if we view his own account of the petrifaction of wood by the action of melted flint, what mortal in his ſenſes can give him credit? It exceeds the power of a glaſs-houſe furnace to melt flint by itſelf: how is it poſſible, then, that the combuſtible ſubſtance of wood ſhould bear to be filled with this dreadful fluid without being burnt? The operation being performed under water, will not anſwer the purpoſe: for wood may be reduced to charcoal, by the heat of a burning-glaſs, under water; and a red hot iron, thrown into a wooden veſſel full of water, will burn a hole in the bottom. Dr Black, who mentions this circumſtance in his Lectures, very juſtly obſerves, that the ſteam which is produced keeps off the water until the iron has produced its effect. Muſt not the ſame effect take place at the bottom of the ſea, even granting, what Dr Hutton never can prove, that flint, by any degree of heat whatever, can be reduced to ſuch a ſtate of tenuity as to be capable of penetrating wood like an anatomical injection? Here indeed he may tell us, as on another occaſion, that the compreſſion of the water is *inſuperable* †. But if this be the caſe, how comes it to paſs, that not only this inſuperable compreſſion, but an additional one (no leſs than the vaſt loads of earth which compoſe the continents of Europe, Aſia, Africa, and America), has actually been overcome, and theſe immenſe tracts thrown up from the bottom of the ocean, by the force of fire which could not conſume a piece of wood?

To ſuppoſe that, by any compreſſion whatever, the element of fire, when applied to a combuſtible body, ſhould be prevented from deſtroying its texture, is certainly without the leaſt foundation; and yet upon this and ſimilar ſuppoſitions proceeds the whole of the Doctor's theory. He differs from thoſe who maintain the volcanic theory, in ſuppoſing that fire may work underground in ſuch a manner as to perform none of its common effects, or indeed none but ſuch as are agreeable to his own hypotheſis. Thus fire, working at the bottom of the ſea, or at an unknown depth under it, ſhall not burn wood; it ſhall not extricate the fixed air from calcareous matter, but melt it ſometimes into one ſubſtance and ſometimes into another; it ſhall not diſſipate the moſt volatile ſubſtance, nor in ſhort perform any effect which we ever ſaw performed by fire: and all this, it ſeems, is demonſtrable by the mere inſpection of fragments of ſtones in a cloſet, without paying the leaſt attention to the operations of nature abroad.

Though it muſt be very evident that a theory built on ſuch extravagant principles cannot ſupport itſelf, we muſt ſtill take notice of the proofs he adduces from the mineral cryſtallizations, &c. On this ſubject it may be obſerved, that there are various ways by which ſubſtances can be cryſtallized or aſſume regular figures. 1. The moſt common is by ſolution in a large quantity of water, from which the bodies are depoſited by cooling, and form diſtinct and regular cryſtals. 2. By ſolution in no greater quantity of boiling water than will keep them ſuſpended; after which they are formed into large maſſes, as is the caſe with alum. 3. By ſlow evaporation, as is the caſe with vitriolated tartar and ſome other ſalts. 4. By efflореſcence, when a ſaline fluid is mixed with a quantity of earthy matter, and kept moiſt for ſome time. Of this we often have an example in moiſt cellars, or other damp places, where we ſhall ſee part of the walls covered with a fine, downy, ſaline matter. In ſalt-butter alſo we ſhall frequently ſee the ſame appearance; where the ſalt ſhoots into ſmall ſpiculæ, though in the common way it cryſtallizes in cubes. 5. By ſublimation, as in the caſe of flowers of benzoin, of corroſive mercury, cinnabar, ſal ammoniac, orpiment, &c. &c. 6. By the meeting of two ſubſtances in an aerial form, as alkaline and fixed air. By the attraction of fixed air from the atmoſphere or otherwiſe, as is the caſe with alkaline ſalts when long expoſed to the common air, or for a ſhorter time to a ſtream of pure fixed air. 7. By precipitation, as in the arbor Dianæ and other metallic vegetations. 8. By means of acids. Thus the reſiduum of Glauber's ſpirit of nitre, if the diſtillation has been performed with an exceſs of acid, will ſhoot into beautiful ramifications like branches of trees. 9. By fuſion, as in regulus of antimony and other metals, ſulphur, &c.

Now of all theſe different ways by which cryſtallization may be effected, Dr Hutton has choſen only the laſt; and this he obſtinately carries through the whole

ſyſtem

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† See n° 45.

53 fut- argu- from nfolu- of in fub- es in- ient.

ſyſtem of nature, whether reaſonable or not. His argument againſt any other mode is chiefly built upon the inſolubility of certain ſubſtances; but this argument has failed in one very remarkable inſtance, *viz.* that of flint, which has been produced by aqueous ſolution. Another inſtance he brings, n° 42, of "marmor metallicum, conſiſting of terra ponderoſa ſaturated with vitriolic acid, a ſubſtance inſoluble in water." Now though this ſubſtance, when once it is formed, may be termed abſolutely inſoluble; yet the fact is certain, that it may be formed by aqueous ſolution and cryſtallization; and we have done ſo by the following proceſs: Let terra ponderoſa be formed into an hepar ſulphuris by any of the common methods; diſſolve the maſs in water; filter the ſolution, and expoſe it to the air in a veſſel kept in a gentle warmth: the phlogiſton of the ſulphur will gradually fly off; the acid attach itſelf to the earth; and in a day or two a great quantity of fine cryſtalline ſpiculæ will be formed, which are a true marmor metallicum.

54 mor llicum ed by alliza-

55 bodies ally ble be ed by us ſo- n.

Thus we learn how many bodies, naturally inſoluble, may yet be formed by aqueous ſolution by reaſon of the ſolubility of their component parts. Sulphur is ſoluble by calcareous earth and by terra ponderoſa, and makes theſe ſubſtances ſoluble in much greater quantity than they naturally are. By the decompoſition of the ſolution of terra ponderoſa, marmor metallicum is produced; and by decompoſing the other, ſelenite or alabaſter. This laſt ſubſtance Dr Hutton has not thought proper to mention, though huge maſſes of rock are compoſed of it; and it is incapable of fuſion without being deſtroyed. Its regular figures, however, afford us a fine example of that ſpecies of cryſtallization which proceeds from precipitation or accretion. The ſelenite is a ſubſtance very little ſoluble in water; yet by the perpetual depoſition of ſmall quantities, we ſee that beautiful and regular cryſtals are formed: and hence we learn another important fact, *viz.* that in order to form theſe cryſtals, it is not always neceſſary that the whole of the ſubſtance ſhould be diſſolved in water at once, though this is the caſe with our artificial cryſtallizations. The largeſt and moſt tranſparent cryſtals, and even the moſt inſoluble in water, may have been formed by the continual accretion of cryſtalline matter from an aqueous ſolution: and thus they may appear in any cavity whatever; for as there is no mineral ſubſtance impermeable to water, it evidently follows that no cavities can be impermeable to it.

56 ne ation enite.

57 cry- ormed n inu- cre-

58 ſpar be ed by us ſo- n.

Among his other inſoluble ſubſtances Dr Hutton mentions fluor and calcareous ſpar. But as we know that one of the component parts of fluor is calcareous earth, naturally ſoluble in water, it is only neceſſary to ſuppoſe a calcareous water like that of Matlock to meet with fluor acid; when as great quantities of fluor would be produced as there are at preſent of calcareous ſtone.

59 like- calca- ſpar.

The ſame thing may be ſaid of calcareous ſpar.—We know that fixed air will precipitate calcareous earth from water, or rediſſolve it after it has been precipitated, according to its quantity. The formation of ſpars, therefore, from calcareous matter diſſolved in water and fixed air, may eaſily be underſtood; and we know that there is no water which does not contain ſome quantity of calcareous earth. Of fixed air there is always great plenty in the bowels of the earth; and according to the quantity uniting itſelf with the diſſolved calcareous earth, either chalky concretions or cryſtalline bodies will be produced. If fire were applied to this calcareous matter in order to fuſe it, an emiſſion of the fixed air would be the certain conſequence; and without this we have not the leaſt evidence that calcareous earth ever did or could undergo any fuſion by heat.

160
Of the formation of pyrites by aqueous ſolution.

With regard to the mineralization of metals by ſulphur, as in the caſe of pyrites, we cannot pretend to explain them particularly; though it was certainly incumbent on the Doctor to have formed theſe bodies, or to have produced ſomething like them, by fuſion, before he determined that they were formed originally in this way. It is eaſy, however, to ſee how the calx of a metal may meet with ſulphur in the earth. We know that ſulphur is ſoluble by alkali, by terra ponderoſa, or by calcareous earth. By expoſing this ſolution to fixed air, part of the ſulphur is ſeparated, and may unite with the metallic earth, or any other thing with which it has an affinity. The cryſtallizations of ſulphur artificially united with metals have not indeed been examined; but before we affirm that a metal is mineralized by fuſion with ſulphur, we ought to perform ſomething like it artificially, which never has been done.

161
Formation of cinnabar in the moiſt way.

As to the invincible argument n° 43, where our author triumphantly challenges his adverſaries to ſhow how petro-ſilex, pyrites, and cinnabar, can be diſſolved in water; it may be replied, that Mr Bergman has decided the matter againſt him with regard to the firſt, by his remarkable experiment of making flint: the ſecond is as yet undecided; for no chemiſt has been able to make pyrites either by ſolution or fuſion. The third is likewiſe decided againſt our theoriſt; for Dr Lewis has ſhown that cinnabar may be prepared by ſolution of ſulphur as well as in the dry way by ſublimation. We have only to ſuppoſe therefore that a calcareous ſolution of ſulphur pervaded this mineral, while a number of particles of quickſilver were diſperſed through it; in which caſe the latter, attracting the ſulphureous particles, would form the cinnabar in queſtion.

162
Of metals found native.

Our author's argument (n° 44) from metals being found in their perfect ſtate, is very inconcluſive. The maſs of native iron he ſpeaks of, is by many thought to be factitious; and as to the ſmall bits of other metals ſometimes found native, they rather make againſt him than otherwiſe: for had they been melted, all the reſt of the matters around them muſt have been melted alſo; in which caſe the ſuperior weight of the metals would have carried them to the bottom of the melted maſs, there to unite as in a common furnace.

163
Coals ſuppoſed to be formed from vegetables.

His arguments concerning bituminous bodies are equally unfortunate with the reſt. That coal is derived from wood has been the opinion of very learned men, particularly Dr Black. The argument, however, is only this, that ſometimes we ſee coals with woody fibres, plainly indicating their vegetable original. But this would hold equally with regard to ſtones; for we often ſee wood penetrated with ſtony matter, while its fibrous texture ſtill remains. In this caſe therefore we might as well ſuppoſe that ſtones are derived from wood as that coals are ſo. A deciſive proof that coals are not produced by fuſion, is, that

164
Certainly not formed by fuſion.

that a living toad has been taken out of the heart of a ſolid piece of coal. This is ſimilar to the entombment of the fiſhes called *pholades* in the heart of ſtones; and as, in the latter caſe, we believe that the ſtone has concreted round the fiſh, ſo we have the ſame reaſon to believe, in the former, that the coal had conſolidated round the toad. All that we can ſay therefore is, that coal is formed by a natural, and not very tedious proceſs, unknown to us; but that this proceſs certainly is not fuſion. His proof nº 47 is altogether inconcluſive; for we have already ſeen that flinty ſubſtances and marmor metallicum may be produced by aqueous ſolution.

165
Dr Hutton's theory entirely erroneous.

166
His method of accounting for the water contained in ſiliceous bodies.

Thus we have ſeen, that, contrary to our author's hypotheſis, the world has undoubtedly had a beginning; that our dry land has not, for ages, been the bottom of the ſea; that we may reaſonably ſuppoſe the deluge to have been the cauſe of all or moſt of the foſſil appearances of ſhells, bones, &c. we meet with; that our author has erred in denying to aqueous ſolution the effects which experience has ſhown it capable of producing, and in aſcribing to fuſion effects which experience doth not warrant; and that his theory, far from having any foundation in chemiſtry, is directly contradicted by that ſcience. It would be tedious and diſagreeable to proceed farther in animadverting on a theory ſo truly unphiloſophical, however elaborate and oſtentatious in a diſplay of facts: we ſhall therefore content ourſelves with taking notice of one other objection to his doctrine, of which he himſelf has been aware, with the anſwer he has given. The objection is, That there are ſometimes found flinty and cryſtalline bodies containing water: It ſeems therefore a contradiction to ſay that ſuch were produced by fuſion. To this the Doctor replies, "It muſt not be here objected, that there are frequently found ſiliceous cryſtals and amethyſts containing water; and that it is impoſſible to confine water even in melted glaſs. It is true, that here, at the ſurface of the earth, melted glaſs cannot, in ordinary circumſtances, be made to receive and incloſe condenſed water; but let us only ſuppoſe a ſufficient degree of compreſſion in the body of melted glaſs, and we can eaſily imagine it to receive and confine water as well as any other ſubſtance. But if, even in our operations, water, by means of compreſſion, may be made to endure the heat of red-hot iron without being converted into vapour, what may not the power of nature be able to perform?"

167
Final teſt of the truth of his hypotheſis.

On this reply we ſhall only obſerve, that the truth of this hypotheſis, as well as of all other parts of it, may eaſily be put to the trial by thoſe who have any of theſe cryſtals in their poſſeſſion. Let one of them be broken, and the water it contains examined. If the cryſtal has been formed by fuſion at the bottom of the ſea, as Dr Hutton ſuppoſes, it will be ſalt; if otherwiſe, freſh. As to his doctrine concerning ſubterraneous heat and volcanoes, there will be occaſion to conſider it under the article VOLCANO.

168
No ſufficient proof of extraordinary changes on the ſurface of the earth.

We muſt now take into conſideration thoſe remarkable changes which are ſuppoſed to have taken place on the globe, in ſuch a manner as entirely to have altered its appearance. Theſe, however, do not appear to have any ſolid foundation. Changes, no doubt, have happened in particular parts; new iſlands have been thrown up from the bottom of the ſea by the force of ſubterraneous fire, and others have been ſwallowed up. But theſe appear to be merely the effects of volcanoes, which are common in many parts of the world; and we are not warranted to conclude, becauſe we ſee a ſmall volcanic iſland ariſe, and another ſwallowed up, that this has been the caſe with the whole habitable world.—An imperfect theory hath indeed been ſuggeſted by Sir William Hamilton, Mr Brydone, and others, concerning the uſe of volcanoes and ſubterraneous fires; from whence it might ſeem probable, though they do not indeed ſay ſo in direct terms, that all the dry land was originally thrown up from the bottom of the ſea by the force of theſe fires. Sir William Hamilton, in his letter to Dr Maty, broaches this theory in the following words. "I am myſelf convinced, that the whole circuit, ſo far as I have examined, within the boundaries marked in the map (extending at leaſt 50 Italian miles in length, and 30 in breadth where broadeſt), is wholly and totally the production of ſubterraneous fires; and that moſt probably the ſea formerly reached the mountains that lie behind Capua and Caſerta, and are a continuation of the Apennines. If I may be allowed to compare ſmall things with great, I imagine the ſubterraneous fires to have worked in this country under the bottom of the ſea, as moles in a field, throwing up here and there a hillock; and that the matter thrown out of ſome of theſe hillocks formed into ſettled volcanoes, filling up the ſpace between the one and the other, has compoſed this part of the continent, and many of the iſlands adjoining.

16
Volca
heory

"From the obſervations I have made upon Mount Ætna, Veſuvius, and the neighbourhood, I dare ſay that, after a careful examination, moſt mountains that are, or have been, volcanoes, would be found to owe their exiſtence to ſubterraneous fire; the direct reverſe of what I find the commonly received opinion.—Nature, though varied, is certainly in general uniform in her operations; and I cannot conceive, that two ſuch conſiderable volcanoes as Ætna and Veſuvius, ſhould have been formed otherwiſe than every other conſiderable volcano of the known world. I do not wonder that ſo little progreſs hath been made in the improvement of natural hiſtory, and particularly in that branch of it which regards the theory of the earth: Nature acts ſlowly; it is difficult to catch her in the fact.

"From repeated obſervations I have made in the neighbourhood of Veſuvius, I am ſure that no virgin ſoil is to be found there; and that all is compoſed of different ſtrata of erupted matter, even to a great depth below the level of the ſea. In ſhort, I have not any doubt in my own mind but that this volcano took its riſe from the bottom of the ſea; and as the whole plain between Veſuvius and the mountains behind Caſerta, which is the beſt part of Campagna Felice, is (under its good ſoil) compoſed of burnt matter, I imagine the ſea to have waſhed the feet of thoſe mountains, until the ſubterraneous fires began to operate, at a period certainly of a moſt remote antiquity.

"The ſoil of the Campagna Felice is very fertile; I ſaw the earth opened in many places. The ſtratum of good ſoil was in general four or five feet thick; under which was a deep ſtratum of cinders, pumice, fragments of lava, and ſuch burnt matter as abounds near

Mount Veſuvius and all volcanoes. The mountains at the back of Caſerta are moſtly of a ſort of limeſtone, and very different from thoſe formed by fire; though Signior Van Vitelli, the celebrated architect, has aſſured me, that in the cutting of the famous aqueduct of Caſerta through theſe mountains, he met with ſome ſoils that had evidently been formed by ſubterraneous fires. The high grounds which extend from Caſtel-a-Mare to the point of Minerva towards the iſland of Caprea, and from the promontory that divides the bay of Naples from that of Salerno, are of limeſtone. The plain of Sorrento, that is bounded by theſe high grounds, beginning at the village of Vico, and ending at that of Maſſa, is wholly compoſed of the ſame ſort of tuſa as that about Naples, except that the cinders or pumice-ſtones intermixed in it are larger than in the Naples tuſa. I conceive, then, that there has been an exploſion in this ſpot from the bottom of the ſea. This plain, as I have remarked to be the caſe with all ſoils produced by ſubterraneous fire, is extremely fertile; whilſt the ground about it, being of another nature, is not ſo. The iſland of Caprea does not ſhow any ſigns of having been formed by ſubterraneous fire, but is of the ſame nature as the high grounds laſt mentioned; from whence it has been probably detached by earthquakes, or the violence of the waves. Rovigliano, an iſland, or rather a rock, in the bay of Caſtel-a-Mare, is likewiſe of limeſtone, and ſeems to have belonged to the original mountains in its neighbourhood: in ſome of theſe mountains alſo, there are petrified fiſh and foſſile ſhells, which I never have found in the mountains which I ſuppoſe to have been formed by exploſion. Bracini, however, in his account of the eruption of 1613, ſays, that he found many ſorts of ſea-ſhells on Veſuvius after that eruption; and P. Ignatio, in his account of the ſame eruption, ſays, that he and his companions picked up many ſhells likewiſe at that time upon the mountain: this circumſtance would induce one to believe, that the water thrown out of Veſuvius during that formidable eruption came from the ſea."

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This may ſerve to ſhow upon what grounds the volcanic theory ſtands: but though we ſhould admit it in its utmoſt extent, the theory of the earth can receive but very little aſſiſtance from it. Sir W. Hamilton himſelf does not ſay that all the mountains have been volcanoes, or that all the ſoil throughout the different quarters of the world hath been thrown up from the bottom of the ſea. If, therefore, there remains but one mountain in the whole world which never was a volcano, we ſhall be as much difficulted to account for the production of that one, as though there were ever ſo many; and at any rate our theory will be abſolutely uſeleſs, becauſe what will account for the origin of that mountain, will alſo account for the origin of others. If we go a ſtep beyond our author, and ſay, that there are no mountains whatever that have not been originally volcanoes, but that all the dry land is the production of ſubterraneous fire, our difficulties are ſo far from being removed, that they are greatly increaſed. The lavas and volcanic aſhes, though in time they become covered with an exceedingly fertile ſoil, remain abſolutely barren for a great number of years; inſomuch that, by the adopters of the volcanic hypotheſis, the period at which Moſes fixes the creation is reckoned by far too late to have given time for covering the many lavas of Italy and Sicily with the depth of earth they juſt now have upon them. The whole world therefore muſt have remained for many ages in a ſtate of abſolute ſterility; and by what means or in what corner of the world vegetation firſt began, remains to be inquired into.

171 Centrifugal force not the cauſe of the earth's ſpheroidal figure.

Without entering further into the theories either of Sir W. Hamilton or any other perſon, it is eaſy to ſee, that all of them are inſufficient to ſolve the difficulties mentioned n° 11. It is common to account for the ſpheroidal figure of the earth from the greater centrifugal force of the equatorial parts than of the polar ones; but this explication can by no means be deemed ſufficient. The globe we inhabit is compoſed of two very different kinds of matter, earth and water. The former has a very conſiderable power of coheſion, beſides the gravitating power; the latter has very little coheſion, and its parts may be ſeparated from each other by whatever will overcome its weight. It follows, therefore, that the ſolid parts of the earth, reſiſting, by their coheſion, the centrifugal force more than the water, ought not to dilate ſo much. The waters of the ocean therefore ought, about the equator, to ſwell up and overflow the land; and this they ought to do at this preſent moment as much as at the firſt creation. That this ought to be the caſe, is evident from the phenomena of the tides. It is not to be doubted but that the attraction of the moon affects the ſolid earth as well as the ſea; but becauſe of the greater coheſion of the former, it cannot yield as the ocean does, and therefore the waters are raiſed to ſome height above it. Mr Whitehurſt and others indeed ſolve this difficulty by ſuppoſing the earth to have been originally fluid. But this is arguing in a circle: for if we deſire them to prove this original fluidity, they will do it by the ſpheroidal figure of the earth; and if the cauſe of the ſpheroidal figure is required, they refer us to the original fluidity. See *Whitehurſt's Inquiry*.—The height to which the waters would have covered the equatorial parts by the centrifugal force, muſt have been equal to the depreſſion at the poles; which, according to M. Buffon, is about 17 miles; according to other mathematicians, 25 or 26 miles.

The other difficulties are ſo totally inexplicable, that Buffon, who ſeems to exert himſelf as much as poſſible in order to remove them, is obliged at laſt to own, that the earth is in a periſhing ſtate; that the hills will be levelled, and the ocean at laſt cover the whole face of the earth; a prophecy which wears no very favourable aſpect to the inhabitants of this globe. —For theſe imaginations, however, there does not ſeem to be the ſmalleſt foundation in nature. The mountains have continued what they were, from the earlieſt accounts of time, without any ſigns of decay. Mount Ætna, beſides the waſte common to it with other mountains, hath been exhauſting itſelf by throwing out incredible quantities of its own ſubſtance; yet it ſtill ſeems to be what it was called by Pindar 2200 years ago, the *pillar of heaven*. It ſeems extremely probable, therefore, that there are powers in the ſyſtem of nature which tend to preſerve, and are capable of counteracting thoſe which tend to deſtroy, the mountains; and per-

172 Natural powers for preſerving the mountains.

haps the late diſcovery concerning the attraction of mountains may ſome time or other throw ſome light on the nature of theſe powers. See Mountain.

173 And iſthmuſes.

The like may be ſaid of the iſthmuſes or narrow necks of land which in ſome parts of the world join different countries together; ſuch as the iſthmus of Darien, of Suez, the Morea, &c. Though the ocean ſeems to beat on theſe with great violence, they are never diminiſhed in bulk, or waſhed away, as, according to Buffon's theory, they ought to be. It is plain, therefore, that there is in nature ſome power by which theſe narrow necks of land are preſerved from the fury of the ocean; for hiſtory does not afford one inſtance of any neck of land of this kind being broken down by the ſea.—It ſeems impoſſible to ſolve the difficulties with regard to the ſtrata and ſhells by any other means than ſuppoſing, that there are in the terreſtrial matter ſeveral diſtinct powers, by which the ſtrata of any particular kind are occaſionally transformed into others; and that the ſhells and other marine bodies were originally depoſited on the ſurface by the deluge. The volcanic hypotheſis, by which ſome attempt to account for the appearance of theſe bodies, will in no ſhape anſwer the purpoſe. By the exploſions of a volcano, ſhells, mud, ſand, &c. might be indiſcriminately thrown up, and ſcattered irregularly about; but we could never find the large beds of ſhells which are frequently to be met with of a conſiderable extent in different parts of the earth.

174 Notion of a chaos ought not to be adopted.

With regard to any degree of certainty, it is ſcarcely to be hoped for on this ſubject. The common notion of the earth's being originally a chaos, ſeems neither to have a foundation in reaſon, nor in the Moſaic account of the creation. It is ſurely inconſiſtent with the wiſdom aſcribed to the Deity, to think that he would create this viſible ſyſtem in confuſion, and then employ it to put itſelf in order. It ſeems more probable, that the earth was originally created with the inequalities of ſurface we ſee it have, and that the natural powers for preſerving it were afterwards ſuperadded. Thus, according to Moſes, the firſt natural agent created, or produced, by directing matter to move in a certain manner, was *light*. This, we know, was abſolutely neceſſary for the evaporation of the water which took place on the ſecond day. Moſes tells us, that the earth was originally covered with water: and we ſee a natural reaſon why it ſhould be ſo; namely, that the evaporation by the atmoſphere might more eaſily take place. When this was done, there being then no more occaſion for the waters in that diffuſed ſtate, they were commanded to retire into the place appointed for them, and thus formed the ocean. Whether this was done by the action of gravity then firſt taking place, or by any other means, we have it not in our power to know, nor will our ſpeculations on this ſubject probably be attended with much benefit. We ſee, however, that the Moſaic account of the creation is perfectly conſiſtent with itſelf, and free from thoſe difficulties with which other ſyſtems are clogged. It is impoſſible to ſhow, how, by any natural power, a confuſed maſs of matter, ſuch as the chaos of the ancient poets, of Drs Burnet and Woodward, the hollow globe of Mr Hutchinſon, the comet of Mr Whiſton, or the vitrified matter of M. Buffon, could put itſelf in the order in which we ſee it. The ſacred hiſtorian ſimply tells us, that God created the heavens and the earth; that the heavens gave no light, and the earth was covered with water. He firſt commanded the light to ſhine, then the air to take up what quantity of water he thought proper for the purpoſes of vegetation. After this, the dry land was made to appear; and the different powers of vegetation already taken notice of were given to it. Next the ſun and moon were created as ſubordinate agents, to *divide the light from the darkneſs*, &c. Then followed the formation of animals and of man.

17 Moſaic count c creatio perfect conſiſte

According to this account, it would appear, that what we call the *laws of nature*, were given to preſerve the earth in that ſhape which the Deity thought proper to give it originally by his own power; and by no means to form it in any particular way, much leſs to put it out of the form which he had already given it: and thus the world, according to the beſt accounts we have, is very little altered in its appearance; and, according to what we can judge, will continue unaltered for ever, unleſs the Creator thinks proper to interpoſe in ſuch a manner as to ſuperſede all the laws he hath given it, and change it into ſome other form.

17 Object to the ſaic ch logy.

From ſome obſervations of Sir W. Hamilton and others, objections have been drawn, as hath been already mentioned, to the Moſaic chronology. Theſe objections are in ſubſtance as follows. In pits, and other natural and artificial openings of the ground, in the neighbourhood of Veſuvius and Ætna, ſeveral beds of lava have been diſcovered at conſiderable depths below each other. Theſe beds of lava in ſome places are covered with ſucceſſive ſtrata of vegetable mould. From this diſpoſition of materials, Sir William concludes that the world muſt have been created at a much more remote period than is generally believed. The different ſtrata of lava found below ground, he obſerves, muſt have proceeded from an equal number of eruptions from the mountain; and ſuch of them as are covered with vegetable ſoil muſt have remained at leaſt 1000 years on the ſurface before they could acquire a ſoil ſufficient for the purpoſes of vegetation. Ten or twelve ſucceſſive ſtrata overlaid with ſoil have already been diſcovered in the bowels of the earth; and it has been ſtrongly aſſerted, that, by digging deeper, many more might have been found. Now, allowing 1000 years for each ſtratum of lava, which the ſupporters of this theory affirm to be too little, the antiquity of the earth cannot be leſs than 12,000 years, which is more than double its age according to the Moſaic account.

The principal fact in this theory is, that 1000 years are neceſſary to the production of a ſoil ſufficient for the nouriſhment and growth of vegetables upon volcanic lavas. This notion is confirmed by a conjecture of the Canonico Recupero, that ſtreams of lava in Sicily have lain for centuries without acquiring a vegetable mould; and by ſome obſcure accounts, that theſe lavas have proceeded from eruptions of Ætna above 1000 years ago. The following conſiderations, however, will render this theory at leaſt extremely dubious.

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Sir William informs us, that ſome lavas are very ſolid, and reſiſt the operation of time much longer than another kind, which, he ſays, "is farinaceous, the particles ſeparating as they force their way out, juſt like meal

meal coming from under the grindſtones. A ſtream of lava of this ſort (he juſtly obſerves), being leſs compact, and containing more earthy particles, would certainly be much ſooner fit for vegetation than one compoſed of the more perfect vitrified matter." He has not, however, ventured to determine whether theſe lavas found below ground were of the former or latter quality; a circumſtance which materially affects the juſtneſs of his calculation.

That ſoil gradually increaſes by decayed vegetables, and the ſediment depoſited by ſnow and rain, is an undeniable fact. The thickneſs or thinneſs of ſoil indicates a greater or leſs time of accumulation. But Sir William has not informed us of the dimenſions of his ſubterraneous vegetable ſtrata; a circumſtance of great moment in inſtituting a calculation of their different eras.

Beſides, eruptions of volcanoes are often accompanied with incredible quantities of aſhes, which fall thick upon all the ground for many miles round; intended by nature, it would appear, quickly to repair the barrenneſs occaſioned by the lava. The muddy water ſometimes thrown out may co-operate powerfully with the aſhes in producing the ſame happy effect.

But Sir William has furniſhed us with facts of a more important nature. The town of Herculaneum was deſtroyed by an eruption in the 97th year of the Chriſtian era. There are evident marks, ſays he, that the matter of ſix eruptions has taken its courſe over Herculaneum; for each of the ſix ſtrata of lava is covered with a vein of good ſoil. Here we have Sir William's own authority for ſix ſtrata of *good ſoil*, accumulated in leſs than 1700 years; which, ſuppoſing them to be all of equal thickneſs, inſtead of 1000 years, leaves not 300 to the production of each.

From the ſame authority we learn, that the crater on the top of the Monte Nuovo, or New Mountain, which was thrown up by ſubterraneous fire no farther back than the year 1538, is now covered with ſhrubs.

There is not on record any eruption from the great crater of Veſuvius from the year 1139 to 1631, a period of only 492 years. But Bracini, who deſcended into it not long before the 1631, tells us, "that the crater was five miles in circumference, and about 1000 paces deep. Its ſides were covered with bruſhwood, and at the bottom there was a plain on which cattle grazed. In the woody parts, bears frequently harboured," &c.

The correſpondence of theſe facts, related by Sir William himſelf, with his favourite notion that 1000 years are neceſſary for the production of a vegetable ſoil, we leave to the reader's conſideration; and ſhall conclude with a few remarks of a different kind.

The appearance of a ſtratum of lava below ground, though not covered with vegetable ſoil, our author conſiders as demonſtrative evidence, that ſuch ſtratum formerly lay above the ſurface, and was thrown out by an eruption. This inference, however, ſeems not altogether juſt. Nothing, with propriety, receives the denomination of an eruption, unleſs when lava or other matter is vomited from the crater, or from ſome new opening made in the mountain. But it deſerves notice, that, in the environs of volcanoes, earthquakes are frequent. That theſe violent concuſſions are the genuine produce of ſubterraneous fire expanding itſelf in every direction, and making ſtrong efforts againſt every ſubſtance which reſiſts the natural tendency of its courſe, is a fact that cannot admit of doubt. It is no leſs certain, that theſe frequent concuſſions ſhake and diſlocate the internal parts of the earth. They cannot fail to ſhatter and diſarrange the natural direction of the original ſtrata; and, of courſe, they muſt give riſe to many ſubterraneous cavities and fiſſures. The nearer the great furnace, which confines the fury of the flames, the greater and more frequent will be the cavities. Every earthquake occaſioned by a volcano is nothing elſe than an effort of the burning matter to enlarge the boundaries by which it is uſually limited. If the quantity of matter and degree of inflammation require a ſpace greatly ſuperior to the internal cavities, an eruption above the ſurface is an infallible conſequence: but when the quantity of matter, or the expanſive force occaſioned by the degree of inflammation, is inſufficient to raiſe the lava to the top of the mountain, an earthquake may be produced; and the lava, without ever appearing above the ſurface, may run below ground in plentiful ſtreams, and fill up all the ſubterraneous cavities and channels. Theſe internal ſtrata of lava may often lie ſo deep as to be below the level of the ſea. In this manner, we conceive it to be not only poſſible, but extremely probable, that beds of lava, having no covering of vegetable ſoil, may be found at great depths, although they never were above the ſurface.

It is much more reaſonable to conclude, that lavas with a layer of ſoil were produced by eruptions, and once lay above the ſurface, till covered by the operation of time, or ſubſequent ſtreams from the mouth of the volcano. But even in this caſe, the argument is not altogether complete; for, as above remarked, earthquakes, with which countries adjacent to volcanoes are perpetually infeſted, often ſink large tracts of land to great depths.

The other parts of the theory of the earth regard the ſituation of the different parts of its ſurface with reſpect to each other; its annual motion round the ſun as a planet; its diurnal motion round its axis; and the different ſtrata whereof it is compoſed, as far as it hath been hitherto found practicable to penetrate into it: for all which, ſee the articles GEOGRAPHY, ASTRONOMY, MINES, STRATA, &c.

*Smell and Bath of the* EARTH. See AGRICULTURE, n° 10.

*Bread made of* EARTH. See BREAD.

EARTH-*Flax*. See AMIANTHUS.

EARTH-*Nuts*, or *Ground-Nuts*, the roots of the ARACHIS hypogæa of Linnæus. They are compoſed of ſeveral ſmall round bulbs or knobs; whence they were termed by Dodonæus, *terræ glandes* or *earth-nuts*. They are eſteemed an excellent food by the Siberians. In Holland likewiſe, they are ſold in the markets and uſed for food. The native country of this plant ſeems to be Africa; though, at preſent, all the American ſettlements abound with it; but many perſons who have reſided in that country affirm that they were originally brought by the ſlaves from Africa. The plant multiplies very faſt in a warm country; but being very impatient of cold, it cannot be propagated in the open air in Britain. The ſeeds muſt therefore be planted in a hot-bed in the ſpring of the year; and when the weather proves warm, they may be expoſed to the open air by degrees. The branches of the plant trail upon the ground; and the flowers, which are yellow, are produced ſingle upon long footſtalks; and as ſoon as the flower begins to decay, the germen is thruſt under ground, where the pod is formed and ripened; ſo that unleſs the ground is opened, they never appear: the roots are annual, but the nuts or ſeeds ſufficiently ſtock the ground in a warm country where they are not carefully taken up.

*Earth-Nuts*, or *Pig-Nuts*. See Bunium.

*Earth-Pucerons*, in natural hiſtory, a name given by authors to a ſpecies of puceron very ſingular in its place of abode. In the month of March, if the turf be raiſed in ſeveral places in any dry paſture, there will be found, under ſome parts of it, cluſters of ants; and, on a farther ſearch, it will be uſually found, that theſe animals are gathered about ſome pucerons of a peculiar ſpecies. Theſe are large, and of a greyiſh colour, and are uſually found in the midſt of the cluſters of ants.

The common abode of the ſeveral other ſpecies of pucerons is on the young branches or leaves of trees; as their only food is the ſap or juice of vegetables, probably theſe *earth* kinds draw out thoſe juices from the roots of the graſſes, and other plants, in the ſame manner that the others do from the other parts. The ants that conduct us to theſe, are alſo our guides where to find the greater part of the others: the reaſon of which is, that as theſe creatures feed on the ſaccharine juices of plants, they are evacuated from their bodies in a liquid form, very little altered from their original ſtate; and the ants, who love ſuch food, find it ready prepared for them in the excrements which theſe little animals are continually voiding *. It has been ſuppoſed by ſome, that theſe were the common pucerons of other kinds, which had crept into the earth to preſerve themſelves from the rigour of the winter. But this does not appear to be the caſe; for they are uſually met with in places very diſtant from trees or plants, on which they ſhould be ſuppoſed before to have fed; and it is very certain, that though many of theſe inſects are killed by the cold, yet many eſcape, and are found very early in the ſpring, ſucking the buds of the peach-tree. There is no doubt of theſe creatures being in a feeding condition when under ground; becauſe otherwiſe the ants would have no temptation to follow them: and it is equally certain, that the ſeveral ſpecies of the pucerons, like thoſe of the caterpillar kinds, have each their peculiar herbs on which they feed, as many of them will die of hunger rather than feed on any others; and it is not at all likely, that theſe earth pucerons had been uſed to feed on leaves of trees and plants, and had left that food for the roots of graſs.

*Earth-Worms*. See Lumbricus.

EARTHQUAKE, in natural hiſtory, a ſudden and violent concuſſion of the earth, generally attended with ſtrange noiſes under-ground or in the air; often deſtroying whole cities at once, throwing down rocks, altering the courſe of rivers, and producing the moſt terrible devaſtations.

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Though there is hardly any country known in which ſhocks of an earthquake have not at ſome time or other been felt, yet there are ſome much more ſubject to them than others. It hath been obſerved, that northern countries in general are leſs ſubject to earthquakes than thoſe ſituated near the equator, or in the ſouthern latitudes; but this does not hold univerſally. The iſlands of Japan, which are ſituated pretty far north, are nevertheleſs exceedingly liable to theſe deſtructive phenomena. Iſlands, in general, are alſo more ſubject to earthquakes than continents; but neither does this hold without exceptions. Some particular parts of continents, and ſome particular iſlands, are more ſubject to them than others lying in the neighbourhood, and differing very little from them in external appearance. Thus, Portugal is more ſubject to earthquakes than Spain, and the latter much more than France; Mexico and Peru more than the other countries of America, and Jamaica more than the other Caribbee iſlands. Earthquakes are frequent, though not often violent, in Italy; but in Sicily they are often terribly deſtructive. Aſia Minor has been remarkably ſubject to them from the remoteſt antiquity; and the city of Antioch in particular hath ſuffered more from earthquakes than any other in that country. The ſame phenomena are ſaid alſo to occur very frequently in the north-eaſtern extremities of Aſia, even in very high latitudes.

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Though there are no phenomena in nature more calculated to impreſs the human mind with terror, and conſequently to be well remembered and taken notice of, than earthquakes; yet the philoſophy of them is but lately arrived at any degree of perfection; and even at this day, the hiſtory of earthquakes is very incomplete. The deſtruction occaſioned by them engroſſes the mind too much to admit of philoſophical ſpeculations at the time they happen: the ſame thing prevents the attentive conſideration of the alterations that take place in the atmoſphere after the earthquake is over, and which might probably throw ſome light on the cauſes which produced it; and the ſuddenneſs of its coming on prevents an exact attention to thoſe ſlight appearances in the earth or air, which, if carefully obſerved, might ſerve as warnings to avoid the deſtruction.—From what obſervations have been made, however, the following phenomena may be deduced, and reckoned pretty certain.

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1. Where there are any volcanoes or burning mountains, earthquakes may reaſonably be expected more frequently than in other countries.

2. If the volcano hath been for a long time quiet, a violent earthquake is to be feared, & *vice verſa*. But to this there are many exceptions.

3. Earthquakes are generally preceded by long droughts; but they do not always come on as ſoon as the drought ceaſes.

4. They are alſo preceded by electrical appearances in the air; ſuch as the aurora borealis, falling ſtars, &c.: but this does not hold univerſally.

5. A ſhort time before the ſhock, the ſea ſwells up and makes a great noiſe; fountains are troubled, and ſend forth muddy water; and the beaſts ſeem frighted, as if ſenſible of an approaching calamity.

6. The air at the time of the ſhock is generally calm and ſerene; but afterwards commonly becomes obſcure and cloudy.

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* See *Aphis*, and *Honey-dew*.

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7. The ſhock comes on with a rumbling noiſe, ſometimes like that of carriages; ſometimes a ruſhing noiſe like wind, and ſometimes exploſions like the firing of cannon are heard. Sometimes the ground heaves perpendicularly upwards, and ſometimes rolls from ſide to ſide Sometimes the ſhock begins with a perpendicular heave, after which the other kind of motion commences. A ſingle ſhock is but of very ſhort duration, the longeſt ſcarcely laſting a minute; but they frequently ſucceed each other at ſhort intervals for a conſiderable length of time.

8. During the ſhock, chaſms are made in the earth; from which ſometimes flames, but oftener great quantities of water, are diſcharged. Flame and ſmoke are alſo emitted from places of the earth where no chaſms can be perceived. Sometimes theſe chaſms are but ſmall; but, in violent earthquakes, they are frequently ſo large, that whole cities ſink down into them at once.

9. The water of the ocean is affected even more than the dry-land. The ſea ſwells to a prodigious height; much more than we could ſuppoſe it raiſed by the mere elevation of its bottom by the ſhock. Sometimes it is divided to a conſiderable depth; and great quantities of air, flames, and ſmoke, are diſcharged from it. The like irregular agitations happen to the waters of ponds, lakes, and even rivers.

10. The ſhock is felt at ſea as well as on land. Ships are affected by a ſudden ſtroke, as if they had run aground or ſtruck upon a rock.

11. The effects of earthquakes are not confined to one particular diſtrict or country, but often extend to very diſtant regions; though no earthquake hath yet been known extenſive enough to affect the whole globe at one time. In thoſe places alſo where the ſhock is not felt on dry land, the irregular agitation of the waters above mentioned is perceived very remarkably.

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All theſe poſitions are verified by the accounts of thoſe earthquakes which have been particularly deſcribed by witneſſes of the beſt character. In 1692, an earthquake happened in Jamaica, attended with almoſt all the terrible circumſtances above mentioned. In two minutes, it deſtroyed the town of Port Royal, at that time the capital of the iſland; and ſunk the houſes in a gulph 40 fathoms deep. It was attended with an hollow rumbling noiſe like that of thunder: the ſtreets roſe like the waves of the ſea; firſt lifting up the houſes, and then immediately throwing them down into deep pits. All the wells diſcharged their waters with the moſt violent agitation. The ſea burſt over its bounds, and deluged all that ſtood in its way. The fiſſures of the earth were in ſome places ſo great, that one of the ſtreets appeared twice as broad as formerly. In many places it opened and cloſed again, and continued this agitation for ſome time. Of theſe openings, great numbers might be ſeen at once. In ſome of them, the people were ſwallowed up at once; in others, the earth caught them by the middle, and cruſhed them to death; while others, more fortunate, were ſwallowed up in one chaſm, and thrown out alive by another. Other chaſms were large enough to ſwallow up whole ſtreets; and others, ſtill more formidable, ſpouted up immenſe quantities of water, drowning ſuch as the earthquake had ſpared. The whole was attended with ſtenches and offenſive ſmells, the noiſe of falling mountains at a diſtance, &c.; and the ſky, in a minute's time, was turned dull and reddiſh, like a glowing oven. Yet, as great a ſufferer as Port-Royal was, more houſes were left ſtanding therein than on the whole iſland beſides. Scarce a planting-houſe, or ſugar-houſe, was left ſtanding in all Jamaica. A great part of them were ſwallowed up, houſes, people, trees, and all, in one gap: in lieu of which, afterwards appeared great pools of water; which, when dried up, left nothing but ſand, without any mark that ever tree or plant had grown thereon. The ſhock was ſo violent, that it threw people down on their knees or their faces as they were running about for ſhelter. Several houſes were ſhuffled ſome yards out of their places, and yet continued ſtanding. One Hopkins had his plantation removed half a mile from the place where it ſtood, without any conſiderable alteration. All the wells in the iſland, as well as thoſe of Port-Royal, from one fathom to ſix or ſeven deep, threw their water out at the top with great violence. Above 12 miles from the ſea, the earth gaped and ſpouted out, with a prodigious force, vaſt quantities of water into the air: yet the greateſt violences were among the mountains and rocks; and it is a general opinion, that the nearer the mountains, the greater the ſhock; and that the cauſe thereof lay among them. Moſt of the rivers were ſtopped up for 24 hours by the falling of the mountains; till ſwelling up, they made themſelves new tracks and channels; tearing up, in their paſſage, trees, &c. After the great ſhock, thoſe people who eſcaped got on board ſhips in the harbour, where many continued above two months; the ſhocks all that time being ſo violent, and coming ſo thick, ſometimes two or three in an hour, accompanied with frightful noiſes like a ruſhing wind, or a hollow rumbling thunder, with brimſtone-blaſts, that they durſt not come aſhore. The conſequence of the earthquake was a general ſickneſs, from the noiſome vapours belched forth, which ſwept away above 3000 perſons.

Earthquake.

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Of the earthquake in Calabria in 1638.

A ſtill more terrible account, if poſſible, is that given by Kircher, of the earthquake which happened in Calabria in the year 1638. This inſtance is an exception to the ſecond general poſition above laid down. In Italy, there had been an eruption of Mount Veſuvius five years before; and in Sicily there had been an eruption of Ætna only two years before this earthquake. The event, however, plainly ſhowed, that the cauſe of the earthquake, whatever it was, had a connection not only with Mount Ætna, which lies in the neighbourhood, but alſo with the volcano of Stromboli, which is 60 miles diſtant. "On the 24th of March (ſays Kircher), we lanched (in a ſmall boat) from the harbour of Meſſina in Sicily, and arrived the ſame day at the promontory of Pelorus. Our deſtination was for the city of Euphemia in Calabria; but on account of the weather, we were obliged to continue three days at Pelorus. At length, wearied with the delay, we reſolved to proſecute our voyage; and although the ſea ſeemed more than uſually agitated, yet we ventured forward. The gulph of Charybdis, which we approached, ſeemed whirled round in ſuch a manner as to form a vaſt hollow, verging to a point in the centre. Proceeding onward, and turning my eyes to Mount Ætna, I ſaw it caſt forth large volumes of ſmoke, of mountainous ſize, which entirely covered the iſland, and blotted out even the ſhores from my view. This, together with the dreadful noiſe, and the ſulphureous ſtench, which was ſtrongly perceived, filled me with apprehenſions that ſome more dreadful calamity was impending. The ſea itſelf ſeemed to wear a very unuſual appearance; thoſe who have ſeen a lake in a violent ſhower of rain all covered over with bubbles, will have ſome idea of its agitations. My ſurpriſe was ſtill increaſed by the calmneſs and ſerenity of the weather; not a breeze, not a cloud, which might be ſuppoſed to put all nature thus into motion. I therefore warned my companion, that an earthquake was approaching; and, after ſome time, making for the ſhore with all poſſible diligence, we landed at Tropæa. But we had ſcarce arrived at the Jeſuits college in that city, when our ears were ſtunned with an horrid ſound, reſembling that of an infinite number of chariots driven fiercely forward, the wheels rattling and the thongs cracking. Soon after this, a moſt dreadful earthquake enſued; ſo that the whole track upon which we ſtood ſeemed to vibrate, as if we were in the ſcale of a balance that continued waving. This motion, however, ſoon grew more violent; and being no longer able to keep my legs, I was thrown proſtrate upon the ground. After ſome time, finding that I remained unhurt amidſt the general concuſſion, I reſolved to venture for ſafety; and running as faſt as I could, reached the ſhore. I did not ſearch long here, till I found the boat in which I had landed, and my companions alſo. Leaving this ſeat of deſolation, we proſecuted our voyage along the coaſt; and the next day came to Rochetta, where we landed, although the earth ſtill continued in violent agitations. But we were ſcarce arrived at our inn, when we were once more obliged to return to our boat; and in about half an hour we ſaw the greateſt part of the town, and the inn at which we had ſet up, daſhed to the ground, and burying all its inhabitants beneath its ruins. Proceeding onward in our little veſſel, we at length landed at Lopizium, a caſtle mid-way between Tropæa and Euphemia the city to which we were bound. Here, wherever I turned my eyes, nothing but ſcenes of ruin and horror appeared; towns and caſtles levelled to the ground; Stromboli, though at 60 miles diſtance, belching forth flames in an unuſual manner, and with a noiſe which I could diſtinctly hear. But my attention was quickly turned from more remote to contiguous danger. The rumbling ſound of an approaching earthquake, which by this time we were grown acquainted with, alarmed us for the conſequences. It every moment ſeemed to grow louder, and to approach more near. The place on which we ſtood now began to ſhake moſt dreadfully; ſo that, being unable to ſtand, my companions and I caught hold of whatever ſhrub grew next us, and ſupported ourſelves in that manner. After ſome time, the violent paroxyſm ceaſing, we again ſtood up, in order to proſecute our voyage to Euphemia, which lay within ſight. In the mean time, while we were preparing for this purpoſe, I turned my eyes towards the city; but could ſee only a frightful dark cloud, that ſeemed to reſt upon the place. This the more ſurpriſed us, as the weather was ſo very ſerene. We waited, therefore, till the cloud was paſſed away: then turning to look for the city, it was totally ſunk; and nothing but a diſmal and putrid lake was to be ſeen where it ſtood."

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In 1693 an earthquake happened in Sicily, which may juſtly be accounted one of the moſt terrible of which we have any account. It ſhook the whole iſland: and not only that, but Naples and Malta ſhared in the ſhock. It was impoſſible for any body in this country to keep on their legs on the dancing earth; nay, thoſe that lay on the ground were toſſed from ſide to ſide as on a rolling billow: high walls leaped from their foundations ſeveral paces, &c. The miſchief it did is amazing; almoſt all the buildings in the countries were thrown down. Fifty-four cities and towns, beſide an incredible number of villages, were either deſtroyed or greatly damaged. We ſhall only inſtance the fate of Catania, one of the moſt famous, ancient, and flouriſhing cities in the kingdom; the reſidence of ſeveral monarchs, and an univerſity. This once famous city had the greateſt ſhare in the tragedy. Father Anthon. Serrovita, being on his way thither, and at the diſtance of a few miles, obſerved a black cloud like night hovering over the city; and there aroſe from the mouth of Montgibello great ſpires of flame, which ſpread all around. The ſea all of a ſudden began to roar and riſe in billows; and there was a blow, as if all the artillery in the world had been at once diſcharged. The birds flew about aſtoniſhed; the cattle in the fields ran crying, &c. His and his companions horſes ſtopped ſhort, trembling; ſo that they were forced to alight. They were no ſooner off, but they were lifted from the ground above two palms; when caſting his eyes towards Catania, he with amazement ſaw nothing but a thick cloud of duſt in the air. This was the ſcene of their calamity; for of the magnificent Catania, there was not the leaſt footſtep to be ſeen. S. Bonajutus aſſures us, that of 18900 inhabitants, 18000 periſhed therein.

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The great earthquake, however, which happened on the 1ſt of November 1755, affords the cleareſt example of all the phenomena above mentioned; having been felt violently in many places both on land and at ſea, and extended its effects to the waters in many other places where the ſhocks were not perceived. At Liſbon in Portugal its effects were moſt ſevere. In 1750, there had been a ſenſible trembling of the earth felt in this city: for four years afterwards, there had been an exceſſive drought; inſomuch that ſome ſprings, formerly very plentiful of water, were dried and totally loſt. The predominant winds were north and north-eaſt, accompanied with various, though very ſmall, tremors of the earth. The year 1755 proved very wet and rainy; the ſummer cooler than uſual; and for 40 days before the earthquake, the weather was clear, but not remarkably ſo. The laſt day of October, the ſun was obſcured, with a remarkable gloomineſs in the atmoſphere. The firſt of November, early in the morning, a thick fog aroſe, which was ſoon diſſipated by the heat of the ſun; no wind was ſtirring; the ſea was calm; and the weather as warm as in June or July in this country. At 35 minutes after nine, without the leaſt warning, except a rumbling noiſe not unlike the artificial thunder in our theatres, a moſt dreadful earthquake ſhook, by ſhort but quick vibrations, the foundations of all the city, ſo that many buildings inſtantly fell. Then, with a ſcarce perceptible pauſe, the nature of the motion

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was changed, and the houſes were toſſed from ſide to ſide, with a motion like that of a waggon violently driven over rough ſtones. This ſecond ſhock laid almoſt the whole city in ruins, with prodigious ſlaughter of the people. The earthquake laſted in all about ſix minutes. At the moment of its beginning, ſome perſons on the river, near a mile from the city, heard their boat make a noiſe as if it had run aground, though they were then in deep water; and at the ſame time they ſaw the houſes falling on both ſides of the river. The bed of the river Tagus was in many places raiſed to its ſurface. Ships were driven from their anchors, and joſtled together with great violence; nor did their maſters know whether they were afloat or aground. A large new quay ſunk to an unfathomable depth, with ſeveral hundreds of people who were upon it; nor was one of the dead bodies ever found. The bar was at firſt ſeen dry from ſhore to ſhore: but ſuddenly the ſea came rolling in like a mountain; and about Belem Caſtle the water roſe 50 feet almoſt in an inſtant. About noon there was another ſhock; when the walls of ſeveral houſes that yet remained were ſeen to open from top to bottom more than a quarter of a yard, and afterwards cloſed again ſo exactly that ſcarce any mark of the injury was left.

ares. At Colares, about 20 miles from Liſbon, and two miles from the ſea, on the laſt day of October, the weather was clear, and uncommonly warm for the ſeaſon. About four o'clock in the afternoon there aroſe a fog, which came from the ſea, and covered the valleys; a thing very unuſual at that ſeaſon of the year. Soon after, the wind changing to the eaſt, the fog returned to the ſea, collecting itſelf, and becoming exceeding thick. As the fog retired, the ſea roſe with a prodigious roaring. The firſt of November, the day broke with a ſerene ſky, the wind continuing at eaſt; but about nine o'clock the ſun began to grow dim; and about half an hour after was heard a rumbling noiſe like that of chariots, which increaſed to ſuch a degree, that it became equal to the exploſions of the largeſt cannon. Immediately a ſhock of an earthquake was felt, which was quickly ſucceeded by a ſecond and third; and at the ſame time ſeveral light flames of fire iſſued from the mountains, reſembling the kindling of charcoal. In theſe three ſhocks, the walls of the buildings moved from eaſt to weſt. In another ſituation, from whence the ſea-coaſt could be diſcovered, there iſſued from one of the hills called the *Fojo* a great quantity of ſmoke, very thick, but not very black. This ſtill increaſed with the fourth ſhock, and afterwards continued to iſſue in a greater or leſs degree. Juſt as the ſubterraneous rumblings were heard, the ſmoke was obſerved to burſt forth at the Fojo; and the quantity of ſmoke was always proportioned to the noiſe. On viſiting the place from whence the ſmoke was ſeen to ariſe, no ſigns of fire could be perceived near it.

orto. At Oporto (near the mouth of the river Douro), the earthquake began about 40 minutes paſt nine. The ſky was very ſerene; when a dreadful hollow noiſe like thunder, or the rattling of coaches at a diſtance, was heard, and almoſt at the ſame inſtant the earth began to ſhake. In the ſpace of a minute or two, the river roſe and fell five or ſix feet, and continued to do ſo for four hours. It ran up at firſt with ſo much violence, that it broke a ſhip's hawſer. In ſome parts the river opened, and ſeemed to diſcharge vaſt quantities of air; and the agitation in the ſea was ſo great about a league beyond the bar, that air was ſuppoſed to have been diſcharged there alſo. Earthquake.

11 At St Ube's. St Ube's, a ſea-port town about 20 miles ſouth of Liſbon, was entirely ſwallowed up by the repeated ſhocks and the vaſt ſurf of the ſea. Huge pieces of rock were detached at the ſame time from the promontory at the weſt end of the town, which conſiſts of a chain of mountains containing fine jaſper of different colours.

12 At Ayamonte in Spain. The ſame earthquake was felt all over Spain, except in Catalonia, Arragon, and Valencia.—At Ayamonte (near where the Guadiana falls into the Bay of Cadiz), a little before 10 o'clock on the firſt of November, the earthquake was felt; having been immediately preceded by a hollow ruſhing noiſe. Here the ſhocks continued for 14 or 15 minutes, damaged almoſt all the buildings, throwing down ſome, and leaving others irreparably ſhattered. In little more than half an hour after, the ſea and river, with all the canals, overflowed their banks with great violence, laying under water all the coaſts of the iſlands adjacent to the city and its neighbourhood, and flowing into the very ſtreets. The water came on in vaſt black mountains, white with foam at the top, and demoliſhed more than one half of a tower at the bar named *De Canala*. In the adjacent ſtrands every thing was irrecoverably loſt; for all that was overflowed ſunk, and the beach became a ſea, without the leaſt reſemblance of what it was before. Many perſons periſhed; for although they got aboard ſome veſſels, yet part of theſe foundered; and others being forced out to ſea, the unhappy paſſengers were ſo terrified, that they threw themſelves overboard. The day was ſerene, and not a breath of wind ſtirring.

13 At Cadiz. At Cadiz, ſome minutes after nine in the morning, the earthquake began, and laſted about five minutes. The water of the ciſterns under ground waſhed backwards and forwards, ſo that a great froth aroſe. At ten minutes after eleven, a wave was ſeen coming from the ſea, at eight miles diſtance, at leaſt 60 feet higher than uſual. It daſhed againſt the weſt part of the town, which is very rocky. Though theſe rocks broke a good deal of its force, it at laſt came upon the city walls, beat in the breaſt-work, and carried pieces of the building of eight or ten ton weight to the diſtance of 40 or 50 yards.—When the wave was gone, ſome parts that are deep at low water, were left quite dry; for the water returned with the ſame violence with which it came. At half an hour after 11 came a ſecond wave, and after that four other remarkable ones; the firſt at ten minutes before twelve; the ſecond, half an hour before one; the third, ten minutes after one; and the fourth, ten minutes before two. Similar waves, but ſmaller, and gradually leſſening, continued with uncertain intervals till the evening.

14 At Gibraltar. At Gibraltar, the earthquake was not felt till after ten. It began with a tremulous motion of the earth, which laſted about half a minute. Then followed a violent ſhock; after that, a trembling of the earth for five or ſix ſeconds; then another ſhock not ſo violent as the firſt, which went off gradually as it began. The whole laſted about two minutes. Some of the guns on the battery were ſeen to riſe, others to ſink, the earth having an undulating motion. Moſt people were ſeized with giddineſs and ſickneſs, and ſome fell down; others

Earth-quake.

were ſtupified; and many that were walking or riding felt no motion in the earth, but were ſick. The ſea roſe ſix feet every 15 minutes; and then fell ſo low, that boats and all the ſmall craft near the ſhore were left aground, as were alſo numbers of ſmall fiſh. The flux and reflux laſted till next morning, having decreaſed gradually from two in the afternoon.

15
At Madrid, Malaga, &c.

At Madrid the earthquake came on at the ſame time as at Gibraltar, and laſted about ſix minutes. At firſt every body thought they were ſeized with a ſwimming in their heads; and afterwards, that the houſes were falling. It was not felt in coaches, nor by thoſe who walked on foot, except very ſlightly; and no accident happened, except that two lads were killed by the fall of a ſtone-croſs from the porch of a church.

Malaga (a ſea-port on the Mediterranean) felt a violent ſhock; the bells rung in the ſteeples; the water of a well overflowed, and as ſuddenly retired.

Saint Lucar (at the mouth of the Guadalquivir) was violently ſhocked, and the ſea broke in and did a great deal of miſchief.

At Seville (16 leagues above the mouth of the Guadalquivir) ſeveral houſes were ſhaken down; the famous tower of the cathedral called *La Giralda* opened in the four ſides; and the waters were ſo violently agitated, that all the veſſels in the river were driven aſhore.

16
At Arzilla in Africa.

In Africa, the earthquake was felt almoſt as ſeverely as it had been in Europe. Great part of the town of Algiers was deſtroyed. At Arzilla (a town in the kingdom of Fez), about ten in the morning, the ſea ſuddenly roſe with ſuch impetuoſity, that it lifted up a veſſel in the bay, and dropped it with ſuch force on the land, that it was broke to pieces; and a boat was found two muſket-ſhot within land from the ſea. At Fez and Mequinez, great numbers of houſes fell down, and a multitude of people were buried in the ruins.

17
At Morocco.

At Morocco, by the falling down of a great number of houſes, many people loſt their lives: and about eight leagues from the city the earth opened and ſwallowed up a village with all the inhabitants, who were known by the name of the *Sons of Beſumba*, to the number of about 8000 or 10,000 perſons, together with all their cattle, &c.; and, ſoon after, the earth cloſed again in the ſame manner as before.

18
At other places on the African coaſt.

At Saile, a great deal of damage was done. Near a third part of the houſes were overthrown; the waters ruſhed into the city with great rapidity, and left behind them great quantities of fiſh.

At Tangier, the earthquake began at ten in the morning, and laſted 10 or 12 minutes. The ſea came up to the walls (a thing never heard of before); and went down immediately with the ſame rapidity with which it aroſe, leaving a great quantity of fiſh behind it. Theſe commotions were repeated 18 times, and laſted till ſix in the evening.

At Tetuan, the earthquake began at the ſame time it did at Tangier, but laſted only ſeven or eight minutes. There were three ſhocks ſo extremely violent, that it was feared the whole city would be deſtroyed.

19
In the iſland of Madeira.

In the city of Funchal, in the iſland of Madeira, a ſhock of this earthquake was firſt perceived at 38 minutes paſt nine in the morning. It was preceded by a rumbling noiſe in the air, like that of empty carriages paſſing haſtily over a ſtone pavement. The obſerver felt the floor immediately to move with a tremulous motion, vibrating very quickly. The ſhock continued more than a minute; during which ſpace, the vibrations, though continual, were weakened and increaſed in force twice very ſenſibly. The increaſe after the firſt remiſſion of the ſhock was the moſt intenſe. The noiſe in the air accompanied the ſhock during the whole of its continuance, and laſted ſome ſeconds after the motion of the earth had ceaſed; dying away like a peal of diſtant thunder rolling through the air. At three quarters paſt eleven, the ſea, which was quite calm, it being a fine day, and no wind ſtirring, retired ſuddenly ſome paces; then riſing with a great ſwell without the leaſt noiſe, and as ſuddenly advancing, overflowed the ſhore, and entered the city. It roſe 15 feet perpendicular above the high-water mark, although the tide, which flows there ſeven feet, was then at half ebb. The water immediately receded; and after having fluctuated four or five times between high and low water mark, it ſubſided, and the ſea remained calm as before. In the northern part of the iſland the inundation was more violent, the ſea there retiring above 100 paces at firſt, and ſuddenly returning, overflowed the ſhore, forcing open doors, breaking down the walls of ſeveral magazines and ſtorehouſes, leaving great quantities of fiſh aſhore and in the ſtreets of the village of Machico. All this was the effect of one riſing of the ſea, for it never afterwards flowed high enough to reach the high-water mark. It continued, however, to fluctuate here much longer before it ſubſided than at Funchal; and in ſome places farther to the weſtward, it was hardly, if it all, perceptible.

Theſe were the phenomena with which this remarkable earthquake was attended in thoſe places where it was violent. The effects of it, however, reached to an immenſe diſtance; and were perceived chiefly by the agitations of the waters, or ſome ſlight motion of the earth. The utmoſt boundaries of this earthquake to the ſouth are unknown; the barbarity of the African nations rendering it impoſſible to procure any intelligence from them, except where the effects were dreadful.

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On the north, however, we are aſſured, that it reached as far as Norway and Sweden. In the former, the waters of ſeveral rivers and lakes were violently agitated. In the latter, ſhocks were felt in ſeveral provinces, and all the rivers and lakes were ſtrongly agitated, eſpecially in Dalecarlia. The river Dala ſuddenly overflowed its banks, and as ſuddenly retired. At the ſame time a lake at the diſtance of a league from it, and which had no manner of communication with it, bubbled up with great violence. At Fahlun, a town in Dalecarlia, ſeveral ſtrong ſhocks were felt.

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In many places of Germany the effects of the earthquake were very perceptible. Throughout the duchy of Holſtein, the waters were violently agitated, particularly thoſe of the Elbe and Trave. In Brandenburg, the water of a lake called *Libſee*, ebbed and flowed ſix times in half an hour, with a dreadful noiſe, the weather being then perfectly calm. The ſame agitation was obſerved in the waters of the lakes called *Muplgaſt* and *Netzo*; but at this laſt place they alſo emitted an intolerable ſtench.

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In Holland, the agitations were more remarkable.

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At Alphen on the Rhine between Leyden and Woerden, in the afternoon of the firſt of November, the waters were agitated to ſuch a violent degree, that buoys were broken from their chains, large veſſels ſnapped their cables, ſmaller ones were thrown out of the water upon the land, and others lying on land were ſet afloat. At Amſterdam, about eleven in the forenoon, the air being perfectly calm, the waters were ſuddenly agitated in their canals, ſo that ſeveral boats broke looſe; chandeliers were obſerved to vibrate in the churches; but no motion of the earth, or concuſſion of any building, was obſerved. At Haerlem, in the forenoon, for near four minutes together, not only the water in the rivers, canals, &c. but alſo all kinds of fluids in ſmaller quantities, as in coolers, tubs, backs, &c. were ſurpriſingly agitated, and daſhed over the ſides, though no motion was perceptible in the veſſels themſelves. In theſe ſmall quantities alſo the fluid apparently aſcended prior to its turbulent motion; and in many places, even the rivers and canals roſe 12 inches perpendicular. At Leyden, between half an hour after 10 and 11 in the forenoon, the waters roſe ſuddenly in ſome of the canals, and made ſeveral very ſenſible undulations, ſo that the boats were ſtrongly agitated. The ſame motion was perceived in the water of the backs of two brew-houſes.

Round the iſland of Corſica, the ſea was violently agitated, and moſt of the rivers of the iſland overflowed their banks. — In the city of Milan in Italy, and throughout that diſtrict, ſhocks were felt. At Turin in Savoy, there was felt a very violent ſhock.

In Switzerland, many rivers turned ſuddenly muddy without rain. The lake of Neufchatel ſwelled to the height of near two feet above its natural level for the ſpace of a few hours. An agitation was alſo perceived in the waters of the lake of Zurich.

At the iſland of Antigua, there was ſuch a ſea without the bar as had not been known in the memory of man; and after it, all the water at the wharfs, which uſed to be ſix feet deep, was not two inches.—At Barbadoes, about two in the afternoon, the ſea ebbed and flowed in a ſurpriſing manner. It ran over the wharfs and ſtreets into the houſes, and continued thus ebbing and flowing till ten at night.

The agitation of the waters was perceived in great numbers of places in Great Britain and Ireland.—Accounts of the moſt remarkable of them follow. At Bariborough in Derbyſhire, between 11 and 12 in the forenoon, in a boat-houſe on the weſt ſide of a large body of water called *Pibley Dam*, ſuppoſed to cover at leaſt 30 acres of land, was heard a ſurpriſing and terrible noiſe; a large ſwell of water came in a current from the ſouth, and roſe two feet on the ſloped dam-head at the north end of the water. It then ſubſided; but returned again immediately, though with leſs violence. The water was thus agitated for three quarters of an hour; but the current grew every time weaker and weaker, till at laſt it entirely ceaſed.

At Buſbridge in Surrey, at half an hour after ten in the morning, the weather being remarkably ſtill, without the leaſt wind, in a canal near 700 feet long and 58 feet broad, with a ſmall ſpring conſtantly running through it, a very unuſual noiſe was heard at the eaſt end, and the water there obſerved to be in great agitation. It raiſed itſelf in a heap or ridge in the middle; and this heap extended lengthwiſe about 30 yards, riſing between two or three feet above the uſual level. After this, the ridge heeled or vibrated towards the north ſide of the canal with great force, and flowed above eight feet over the graſs walk on that ſide. On its return back into the canal, it again ridged in the middle, and then heeled with yet greater force to the ſouth ſide, and flowed over its graſs walk. During this latter motion, the bottom on the north ſide was left dry for ſeveral feet. This appearance laſted for about a quarter of an hour, after which the water became ſmooth and quiet as before. During the whole time, the ſand at the bottom was thrown up and mixed with the water; and there was a continual noiſe like that of water turning a mill.

At Cobham in Surrey, between 10 and 11 o'clock, a perſon was watering a horſe at a pond fed by ſprings. Whilſt the animal was drinking, the water ſuddenly ran away from him, and moved towards the ſouth with ſuch ſwiftneſs, that the bottom of the pond was left bare. It returned again with ſuch impetuoſity, that the man leaped backwards to ſecure himſelf from its ſudden approach. The ducks were alarmed at the firſt agitation, and inſtantly flew all out of the pond.

At Dunſtall in Suffolk, the water of a pond roſe gradually for ſeveral minutes in the form of a pyramid, and fell down like a water-ſpout. Other ponds in the neighbourhood had a ſmooth flux and reflux from one end to the other.

Near the city of Durham, about half an hour after ten, a gardener was alarmed by a ſudden ruſhing noiſe from a pond, as if the head of the pond had been broken down: when caſting his eye on the water, he ſaw it gradually riſe up, without any fluctuating motion, till it reached a grate which ſtood ſome inches higher than the common water level. After this it ſubſided, and then ſwelled again; thus continuing to riſe and fall during the ſpace of ſix or ſeven minutes, making four or five returns in the ſpace of one minute. The pond was about 40 yards long and 10 broad.

At Earſy Court, Berks, about 11 o'clock, as a gardener was ſtanding by a fiſh pond, he felt a violent trembling of the earth, which laſted about a minute. Immediately after, he obſerved a motion of the water from the ſouth to the north end of the pond, leaving the bottom at the ſouth end altogether dry for about ſix feet. It then returned, and flowed at the ſouth end, riſing three feet up the ſlope bank; and immediately after returned to the north bank, riſing there alſo about three feet. In the time between the flux and reflux, the water ſwelled up in the middle of the pond, collected in a ridge about 20 inches higher than the level on each ſide, and boiled like a pot. This agitation from ſouth to north laſted about four minutes.

At Eaton-bridge, Kent, in a pond about an acre in ſize, a dead calm, and no wind ſtirring, ſome perſons heard a noiſe, and imagining ſomething had been tumbling in, ran to ſee what was the matter. On their arrival at the pond, to their ſurpriſe they ſaw the water open in the middle, ſo that they could ſee a poſt a good way down, almoſt to the bottom. The water in the mean time daſhed up over a bank two feet high, and perpendicular to the pond. This was repeated ſeveral times with a great noiſe.

At Eyam-bridge, Derbyſhire (in the Peak), the overſeer of the lead-mines ſitting in his writing-room about 11 o'clock, felt a ſudden ſhock, which very ſenſibly raiſed him up in his chair, and cauſed ſeveral pieces of plaſter to drop from the ſides of the room. The roof was ſo violently ſhaken, that he imagined the engine ſhaft had been falling in. Upon this he immediately ran to ſee what was the matter, but found every thing in perfect ſafety.—At this time two miners were employed in carting, or drawing along the drifts of the mines, the ore and other materials to be raiſed up at the ſhafts. The drift in which they were working was about 120 yards deep, and the ſpace from one end to the other 50 yards or upwards. The miner at the end of the drift had juſt loaded his cart, and was drawing it along; but he was ſuddenly ſurpriſed by a ſhock, which ſo terrified him, that he immediately quitted his employment, and ran to the weſt end of the drift to his partner, who was no leſs terrified than himſelf. They durſt not attempt to climb the ſhaft, leſt that ſhould be running in upon them: but while they were conſulting what means they ſhould take for their ſafety, they were ſurpriſed by a ſecond ſhock more violent than the firſt; which frightened them ſo much, that they both ran precipitately to the other end of the drift. They then went down to another miner who worked about 12 yards below them. He told them that the violence of the ſecond ſhock had been ſo great, that it cauſed the rocks to grind upon one another. His account was interrupted by a third ſhock, which, after an interval of four or five minutes, was ſucceeded by a fourth; and, about the ſame ſpace of time after, by a fifth; none of which were ſo violent as the ſecond. They heard, after every ſhock, a loud rumbling in the bowels of the earth, which continued about half a minute, gradually decreaſing, or ſeeming to remove to a greater diſtance.

At Shireburn caſtle, Oxfordſhire, at a little after ten in the morning, a very ſtrange motion was obſerved in the water of a moat which encompaſſes the houſe. There was a pretty thick fog, not a breath of air, and the ſurface of the water all over the moat as ſmooth as a looking-glaſs, except at one corner, where it flowed into the ſhore, and retired again ſucceſſively, in a ſurpriſing manner. In what manner it began to move is uncertain, as nobody obſerved the beginning of its motion. The flux and reflux, when ſeen, were quite regular. Every flood began gently; its velocity increaſed by degrees, when at laſt it ruſhed in with great impetuoſity, till it had attained its full height. Having remained for a little time ſtationary, it then retired, ebbing gently at firſt, but afterwards ſinking away with great ſwiftneſs. At every flux, the whole body of water ſeemed to be violently thrown againſt the bank; but neither during the time of the flux nor that of the reflux, did there appear even the leaſt wrinkle of a wave on the other parts of the moat. Lord Viſcount Parker, who had obſerved this motion, being deſirous to know whether it was univerſal over the moat, ſent a perſon to the other corner of it, at the ſame time that he himſelf ſtood about 25 yards from him, to examine whether the water moved there or not. He could perceive no motion there, or hardly any: but another, who went to the north-eaſt corner of the moat, diagonally oppoſite to his lordſhip, found it as conſiderable there as where he was. His lordſhip imagining, that in all probability the water at the corner diagonally oppoſite to where he was would ſink as that by him roſe, he ordered the perſon to ſignify by calling out, when the water by him began to ſink, and when to riſe. This he did; but, to his lordſhip's great ſurpriſe, immediately after the water began to riſe at his own end, he heard his voice calling that it began to riſe with him alſo; and in the ſame manner he heard that it was ſinking at his end, ſoon after he perceived it to ſink by himſelf. A pond juſt below was agitated in a ſimilar manner; but the riſings and ſinkings of it happened at different times from thoſe at the pond where lord Parker ſtood.

At White Rock in Glamorganſhire, about two hours ebb of the tide, and near three quarters after ſix in the evening, a vaſt quantity of water ruſhed up with a prodigious noiſe; floated two large veſſels, the leaſt of them above 200 tons; broke their moorings, drove them acroſs the river, and had like to have overſet them. The whole riſe and fall of this extraordinary body of water did not laſt above ten minutes, nor was it felt in any other part of the river, ſo that it ſeemed to have guſhed out of the earth at that place.

In Sc land.

At Loch Lomond in Scotland, about half an hour after nine in the morning, all of a ſudden, without the leaſt guſt of wind, the water roſe againſt its banks with great rapidity, but immediately ſubſided, till it was as low in appearance as any body then preſent had ever ſeen it in the greateſt ſummer-drought. Inſtantly it returned towards the ſhore, and in five minutes time roſe again as high as before. The agitation continued at the ſame rate till 15 minutes after ten the ſame morning; taking five minutes to riſe, and as many to ſubſide. From 15 minutes after 10 till 11, the height of every riſe came ſomewhat ſhort of that immediately preceding, taking five minutes to flow, and as many to ebb, till the water was entirely ſettled. The greateſt perpendicular height of this ſwell was two feet four inches. A ſtill more remarkable phenomenon attending the earthquake in this lake was, that a large ſtone lying at ſome diſtance from ſhore, but in ſuch ſhallow water that it could eaſily be ſeen, was forced out of its place in the lake upon dry land, leaving a deep furrow in the ground all along the way in which it had moved.

In Loch Neſs, about half an hour after nine, a very great agitation was obſerved in the water. About ten the river Oich, which runs on the north ſide of Fort Auguſtus, into the head of the loch, was obſerved to ſwell very much, and run upwards from the loch with a pretty high wave, about two or three feet higher than the ordinary ſurface. The motion of the wave was againſt the wind, and it proceeded rapidly for about 200 yards up the river. It then broke on a ſhallow, and flowed three or four feet on the banks, after which it returned gently to the loch. It continued ebbing and flowing in this manner for about an hour, without any ſuch remarkable waves as the firſt; but about 11 o'clock, a wave higher than any of the reſt came up, and broke with ſo much force on the low ground on the north ſide of the river, that it run upon the graſs upwards of 30 feet from the river's bank.

In I

At Kinſale, between two and three in the afternoon, the weather being very calm, and the tide near full, a large

large body of water ſuddenly poured into the harbour with ſuch rapidity, that it broke the cables of two ſloops, each moored with two anchors, and of ſeveral boats lying between Sicily and the town. But juſt at the time that a great deal of miſchief was apprehended by all the veſſels running foul of each other, an eddy whirled them round ſeveral times, and then hurried them back again with the ſame rapidity as before. This was ſeveral times repeated; and while the current ruſhed up at one ſide of the harbour, it poured down with equal violence at the other. A veſſel that lay all this time in the pool did not ſeem to be any ways affected by it; nor was the violence of the currents much perceived in the deeper parts of the harbour, but raged with moſt violence on the flats. The bottom of the harbour, which is muddy, was much altered; the mud being waſhed from ſome places, and depoſited in others. The perpendicular riſe of the water at one quay was meaſured, and found to be five feet and an half; and is ſaid to have been much higher at another, where it overflowed, and poured into the market-place with ſuch rapidity, that ſome people who were on the quay immediately ran off, and yet could not prevent themſelves from being overtaken and immerſed knee-deep in the water. The agitations extended ſeveral miles up the river; but, as in the harbour, were moſt perceived in the ſhalloweſt places. The ſucceſſive riſings and fallings of the water continued about ten minutes, and then the tide returned to its natural courſe. Between ſix and ſeven in the evening, the water roſe again, though not with ſo great violence as before, and it continued to ebb and flow alternately till three in the morning. The waters did not riſe gradually at firſt; but, with a hollow and horrid noiſe, ruſhed in like a deluge, riſing ſix or ſeven feet in a minute, and as ſuddenly ſubſiding. They were as thick as puddle, very black, and ſtank intolerably.—From different accounts it appeared, that the water was affected in a ſimilar manner all along the coaſt to the weſtward of Kinſale.

In France, ſhocks were perceived in ſeveral places; as at Bayonne, Bourdeaux, and Lyons. Commotions of the waters alſo were obſerved at Angouleſme, Bleville, Havre de Grace, &c. but not attended with the remarkable circumſtances above mentioned.

Theſe are the moſt ſtriking phenomena with which the earthquake of Nov. 1. 1755 was attended on the ſurface of the earth. Thoſe which happened below ground cannot be known but by the changes obſerved in ſprings, &c. which were in many places very remarkable.—At Colares, on the afternoon of the 31ſt of October, the water of a fountain was greatly decreaſed: on the morning of the firſt of November it ran very muddy; and, after the earthquake, returned to its uſual ſtate both as to quantity and clearneſs. On the hills, numbers of rocks were ſplit; and there were ſeveral rents in the ground, but none conſiderable. In ſome places where formerly there had been no water, ſprings burſt forth, which continued to run.—Some of the largeſt mountains in Portugal were impetuouſly ſhaken as it were from their foundation; moſt of them opened at their ſummits, ſplit and rent in a wonderful manner, and huge maſſes of them were thrown down into the ſubjacent valleys.—From the rock called *Pedra de Alvidar*, near the hill Fejo, a kind of parapet was broken off, which was thrown up from its foundation in the ſea.—At Varge, on the river Macaas, at the time of the earthquake, many ſprings of water burſt forth, ſome ſpouted to the height of 18 or 20 feet, throwing up ſand of various colours, which remained on the ground. A mountainous point, ſeven or eight leagues from St Ube's, cleft aſunder, and threw off ſeveral vaſt maſſes of rock.—In Barbary, a large hill was rent in two; the two halves fell different ways, and buried two large towns. In another place, a mountain burſt open, and a ſtream iſſued from it as red as blood. At Tangier, all the fountains were dried up, ſo that there was no water to be had till night.—A very remarkable change was obſerved on the medicinal waters of Toplitz, a village in Bohemia famous for its baths. Theſe waters were diſcovered in the year 762; from which time the principal ſpring of them had conſtantly thrown out hot water in the ſame quantity, and of the ſame quality. On the morning of the earthquake, between 11 and 12 in the forenoon, the principal ſpring caſt forth ſuch a quantity of water, that in the ſpace of half an hour all the baths ran over. About half an hour before this great increaſe of the water, the ſpring flowed turbid and muddy; then having ſtopped entirely for a minute, it broke forth again with prodigious violence, driving before it a conſiderable quantity of reddiſh ochre. After this it became clear, and flowed as pure as before. It ſtill continues to do ſo; but the water is in greater quantity, and hotter, than before the earthquake. At Angouleſme in France, a ſubterraneous noiſe like thunder was heard; and preſently after the earth opened, and diſcharged a torrent of water mixed with red ſand. Moſt of the ſprings in the neighbourhood ſunk in ſuch a manner, that for ſome time they were thought to be quite dry. In Britain, no conſiderable alteration was obſerved in the earth, except that, near the lead mine above mentioned in Derbyſhire, a cleft was obſerved about a foot deep, ſix inches wide, and 150 yards in length.

30
Effects of the earthquake at ſea.

At ſea, the ſhocks of this earthquake were felt moſt violently. Off St Lucar, the captain of the Nancy frigate felt his ſhip ſo violently ſhaken, that he thought ſhe had ſtruck the ground; but, on heaving the lead, found he was in a great depth of water. Captain Clark from Denia, in N. Lat. 36. 24. between nine and ten in the morning, had his ſhip ſhaken and ſtrained as if ſhe had ſtruck upon a rock, ſo that the ſeams of the deck opened, and the compaſs was overturned in the binacle. The maſter of a veſſel bound to the American iſlands, being in N. Lat. 25°, W. Long. 40°, and writing in his cabin, heard a violent noiſe, as he imagined, in the ſteerage; and while he was aſking what the matter was, the ſhip was put into a ſtrange agitation, and ſeemed as if ſhe had been ſuddenly jerked up and ſuſpended by a rope faſtened to the maſt-head. He immediately ſtarted up with great terror and aſtoniſhment; and looking out at the cabin-window, ſaw land, as he took it to be, at the diſtance of about a mile. But, coming upon the deck, the land was no more to be ſeen, but he perceived a violent current croſs the ſhip's way to the leeward. In about a minute, this current returned with great impetuoſity, and at a league's diſtance he ſaw three craggy-pointed rocks throwing up water of various colours reſembling fire.

Earthquake.

fire. This phenomenon, in about two minutes, ended in a black cloud, which aſcended very heavily. After it had riſen above the horizon, no rocks were to be ſeen; though the cloud, ſtill aſcending, was long viſible, the weather being extremely clear.—Between nine and ten in the morning, another ſhip, 40 leagues weſt of St Vincent, was ſo ſtrongly agitated, that the anchors, which were laſhed, bounced up, and the men were thrown a foot and an half perpendicularly up from the deck. Immediately after this, the ſhip ſunk in the water as low as the main chains. The lead ſhowed a great depth of water, and the line was tinged of a yellow colour and ſmelt of ſulphur. The ſhock laſted about ten minutes, but they felt ſmaller ones for the ſpace of 24 hours.

51 Of the earthquakes in Calabria in 1783.

Such were the phenomena of this very remarkable and deſtructive earthquake, which extended over a tract of at leaſt four millions of ſquare miles. The earthquakes, however, which in the year 1783 ruined a great part of Italy and Sicily, tho' much more confined in their extent, ſeem to have been not at all inferior in violence.

32 Sir William Hamilton's account of their extent.

Sir William Hamilton, who wrote a particular account of their effects, informs us, that "if, on a map of Italy, and with your compaſs on the ſcale of Italian miles you were to meaſure off 22, and then, fixing the central point in the city of Oppido (which ſeemed to be the ſpot where the earthquake had exerted its greateſt force) form a circle (the radii of which will be 22 miles), you will then include all the towns, villages, &c. that have been utterly ruined, and the ſpots where the greateſt mortality happened, and where there have been the moſt viſible alterations on the face of the earth: then extend your compaſs on the ſame ſcale to 72 miles, preſerving the ſame centre, and form another circle, you will include the whole country that has any mark of having been affected by the earthquake. A gradation was plainly obſerved in the damage done to the buildings, as alſo in the degree of mortality, in proportion as the countries were more or leſs diſtant from this ſuppoſed centre of the evil." Another circumſtance was particularly remarked, and in which this earthquake differed very conſiderably from others, viz. that if two towns were ſituated at an equal diſtance from this centre, one on the hill, the other on the plain or in a bottom, the latter always ſuffered more by the ſhocks of the earthquakes than the former.

33 General account of their effects.

From the moſt authentic reports and accounts received by his Sicilian majeſty's ſecretary of ſtate, it was learned, that the part of Calabria which had been moſt affected by this heavy calamity, is that comprehended between the 38th and 39th degree of latitude: that the greateſt force of the earthquake ſeemed to have exerted itſelf from the foot of thoſe mountains of the Apennines called the Monte Dijo, Monte Sacro, and Monte Caulene, extending weſtward to the Tyrrhene ſea: that the towns, villages, and farm-houſes neareſt theſe mountains, ſituated either on the hills or the plain, were totally ruined by the ſhock of the 5th of February about noon: that as the towns and villages were at a greater diſtance from this centre, the damage they received was leſs conſiderable; but that even theſe more diſtant towns had been greatly damaged by the ſubſequent ſhocks of the earthquakes, and effectually by thoſe of the 7th, 26th, and 28th of February, and that of the 1ſt of March; that from the firſt ſhock of the 5th of February, the earth had been in a continual tremor; and that the ſhocks were more ſenſibly felt at times in ſome parts of the afflicted provinces than at others; that the motion of the earth had been either whirling like a vortex, horizontal, or by pulſations, or by beatings from the bottom upwards. This variety of motions increaſed the apprehenſions of the miſerable inhabitants, who expected every moment that the earth would open under their feet, and ſwallow them up. It was ſaid alſo that the rains had been continued and violent, frequently accompanied with irregular and furious guſts of wind; and that from all theſe cauſes, the face of that part of Calabria comprehended between the 38th and 39th degrees was entirely altered, particularly on the weſtern ſide of the mountains above mentioned: that many openings and cracks had been made in thoſe parts; ſome hills had been much lowered, and others entirely ſwallowed up; deep chaſms had been made, by which many roads were rendered impaſſable; huge mountains were ſaid to have been ſplit aſunder, and the parts of them driven to a conſiderable diſtance; deep valleys to have been filled up by the concourſe of the mountains which formed them before; the courſe of rivers altered; many ſprings of water dried up, and new ones formed in their place, &c. A ſingular phenomenon was ſaid to have been obſerved at Laureana in Calabria Ultra; viz. that two whole tenements, with large plantations of olive and mulberry trees, ſituated in a valley perfectly level, had been detached by the earthquake, and tranſplanted, with the trees ſtill remaining in their places, to the diſtance of about a mile from their firſt ſituations; and that from the ſpot on which they formerly ſtood, hot water had ſprung up to a conſiderable height, mixed with ſand of a ferruginous nature: that near this place alſo ſome countrymen and ſhepherds had been ſwallowed up, with their teams of oxen, and their flocks of goats and ſheep. The number of lives loſt was eſtimated at 32,367; but Sir William Hamilton is of opinion, that, including ſtrangers, it could not be leſs than 40,000.

Fate

The fate of the inhabitants of Scilla was extremely affecting. On the firſt ſhock of the earthquake February 5th, they had fled along with their prince to the ſea-ſhore, where they hoped for ſafety; but in the night-time a furious wave (ſaid to have been boiling hot, and by which many people were alleged to have been ſcalded) overflowed the land for three miles, ſweeping off in its return 2473 of the inhabitants, among whom was the prince himſelf, who were at that time either on the ſtrand or in boats near the ſhore. But the moſt ſingular of all the phenomena enumerated in theſe accounts was, that a hill, about 500 palms in height, and 1300 in circumference at its baſis, jumped to the diſtance of about four miles from the place where it formerly ſtood. At the ſame time the hill on which the town of Oppido ſtood, which extended about three miles, parted in two; and as its ſituation was between two rivers, both of theſe were of courſe ſtopped up; two great lakes were formed, and by their continual increaſe threatened to infect the air by their noxious exhalations.

Such were the accounts at firſt propagated and univerſally believed; but Sir William Hamilton, who made a tour through the ruined country that ſame year, found

found that, though the effects in general were very dreadful, ſtill there had been ſome exaggeration in ſeveral particulars. He ſet ſail, for the purpoſe of making this tour, on the 2d of May, for Naples, and ſoon landed on the coaſt of Calabria Citra. The firſt appearances of the earthquake were obſerved at Cedraro; ſome of the principal inhabitants of that city having quitted their habitations, though Sir William could not perceive that any damage had been done. At St Lucido, the baron's palace and the church ſteeple had ſuffered, and moſt of the inhabitants were in barracks; but wiſhing to come as ſoon as poſſible to the centre of that ſcene of deſolation, he ſet ſail again, and landed on the 6th of May at the town of Pizzo in Calabria Ultra. This town is ſituated on a volcanic tufa, and had been greatly damaged by the earthquake of February 5th, but completely ruined by that of the 28th of March. Here he was aſſured, that the volcano of Stromboli, which is oppoſite, and in full view of the town, though diſtant about 50 miles, had ſmoked leſs and thrown up a ſmaller quantity of inflamed matter during the earthquakes than it had done for ſome years before; and that ſlight ſhocks ſtill continued to be felt. Sir William had ſoon a convincing proof that this laſt information was true; for, ſleeping that night in his boat, (called a *Malteſe Speronara*), he was awakened with a ſmart ſhock, which ſeemed to lift up the bottom of the boat, but was not attended with any ſubterraneous noiſe.

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From Pizzo he paſſed through a moſt beautiful country to Monteleone. This town, anciently called *Vibo Valentia*, is finely ſituated on a hill, overlooking the ſea and the fine rich plains through which he had juſt paſſed; which are bounded by the Apennines, and crowned by Aſpramonte the higheſt of them all. They were formerly interſperſed with towns and villages; but at that time all of them lay in ruins. Monteleone ſuffered little on the 5th of February, but was greatly damaged on the 28th of March. Here every one agreed, that the ſhocks of the earthquake ſeemed to come with a rumbling noiſe from the weſtward; beginning uſually with the horizontal motion, and ending with the vorticoſe, by which laſt the greateſt part of the buildings in this province were deſtroyed. It was a general obſervation alſo, that before a ſhock the clouds ſeemed to be ſtill and motionleſs, and that immediately after a heavy ſhower of rain a ſhock quickly followed. Here Sir William had an opportunity of ſeeing many people who had been thrown down by the violence of the ſhocks. Several peaſants told him, that the motion of the earth was ſo violent, that the heads of the largeſt trees almoſt touched the ground from ſide to ſide; that during a ſhock, the horſes and oxen extended their legs wide aſunder, that they might not be thrown down; and that they gave evident ſigns of being ſenſible of the approach of each ſhock. "I myſelf (ſays he) have obſerved, that in thoſe parts which have ſuffered moſt by earthquakes, the braying of an aſs, the neighing of a horſe, or the cackling of a gooſe, always drove people out of their barracks, and was the occaſion of many Pater-noſters and Ave-marias being repeated, in expectation of a ſhock."

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From Monteleone our author deſcended into the plain, having paſſed through many towns and villages which had been more or leſs ruined according to their vicinity to the plain. The town of Mileto, ſtanding in a bottom, was totally ruined, not a houſe being left ſtanding. At ſome diſtance he ſaw Soriano, and the noble Dominican convent, a heap of ruins. In this day's journey, he obſerves, that all habitations ſituated upon high grounds, the ſoil of which is a gritty ſandſtone, ſomewhat like a granite, but without the conſiſtence, had ſuffered leſs than thoſe ſituated on the plain; the latter being univerſally levelled with the ground. The ſoil of the plain is a ſandy clay, white, red, and brown; but the white prevails moſt, and is full of marine ſhells, particularly ſcollops. It is interſected in many parts by rivers and torrents, which have produced wide and deep ravines all over the country. Paſſing through the ruined town of St Pietro, in his way to Roſarno, our author had a diſtant view of Sicily and the ſummit of Mount Etna, which then ſent forth a conſiderable ſmoke. Juſt before his arrival at Roſarno, he paſſed over a ſwampy plain, in many parts of which he was ſhown ſmall hollows in the earth, of the ſhape of an inverted cone. They were covered with ſand, as was the ſoil near them. He was informed, that during the earthquake of the 5th of February, a fountain of water, mixed with ſand, had been driven up from each of theſe ſpots to a conſiderable height. Here he ſpoke to a peaſant who had been an eye-witneſs, and was even covered with the water and ſand; but he aſſured him, that it was not hot, as had been repreſented. Before this appearance, he ſaid, the river was dry; but ſoon after returned and overflowed its banks. He afterwards found, that the ſame phenomenon had been conſtant with reſpect to all other rivers in the plain, during the dreadful ſhock of the 5th of February. This phenomenon, our author thinks, may be eaſily explained by ſuppoſing the firſt impulſe of the earthquake to have come from the bottom upwards, which all the inhabitants of the plain atteſted to be fact; the ſurface of the plain ſuddenly riſing, the rivers, which are not deep, would naturally diſappear, and the plain returning with violence to its former level, the rivers muſt naturally have returned and overflowed, as the ſudden depreſſion of the boggy grounds would as naturally force out the water that lay hid under their ſurface. It was obſerved in the other parts where this phenomenon had been exhibited, that the ground was always low and ruſhy. Between this place and Roſarno they paſſed the river Meſſano or Metauro (which is near the town above mentioned) on a ſtrong timber-bridge, 700 palms long, lately built by the duke of Monteleone. From the cracks made in the banks and in the bed of the river by the earthquake, it was quite ſeparated in one part; and the level on which the piers were placed having been variouſly altered, the bridge had taken an undulated form, ſo that the rail on each ſide was curiouſly ſcolloped; but the ſeparated parts having been joined again, it was then paſſable. Our author was alſo informed, that at the time of the earthquake the river was perfectly dry for ſome ſeconds, and then returned with violence and overflowed; and that the bridge undulated in a moſt extraordinary manner. By the earthquake in the plain, our author underſtands the ſhock of the 5th of February, which did ſo much damage without giving any previous notice.

40
Leſs violent on the high grounds than on the plain.

41
Conical openings made in the earth, which ſpouted up water during the ſhock.

42
Rivers dried up for a ſhort time.

43
This phenomenon accounted for.

44
Appearance of a bridge on the Metauro.

The town of Roſarno, with the duke of Monteleone's palace there, was entirely ruined; but the walls remained about ſix feet high, and were at that time fitting up as barracks. The only building that remained unhurt at Roſarno was the town gaol, in which were three notorious villains, who would probably have loſt their lives if they had remained at liberty.

45
Explanation of the change of place of two tenements of land.

46
Cracks in the earth opened wide during the earthquake, and afterwards cloſed.

47
No hot water thrown up by the earth.

From Roſarno Sir William proceeded to Laureana, where he was conducted to the place where two tenements were ſaid to have exchanged ſituations. This fact, which at the firſt relation appeared ſo incredible, Sir William aſſures us was true, and very eaſily accounted for. Theſe tenements were ſituated in a valley ſurrounded by high grounds; and the ſurface of the earth, which was removed, had probably been undermined by little rivulets which come from the mountains, and were then plainly diſcernible on the bare ſpot which the tenements had quitted. Their courſe down the valley was ſufficiently rapid to prove that it had not been a perfect level as was repreſented. The earthquake, he ſuppoſes, had opened ſome depoſitories of rain-water in the clay-hills which ſurround the valley; which water, mixed with the looſe ſoil, taking its courſe ſuddenly through the undermined ſurface, lifting it up with the large olive and mulberry trees, and a thatched cottage, floated the whole piece of ground, with all its vegetation, about a mile down the valley, where it then ſtood with moſt of the trees erect. Theſe two tenements were about a mile long and half a mile broad. In the neighbourhood were ſeveral cracks, none of them above a foot wide; but our author was aſſured, that during the earthquake they had opened wide, and ſwallowed up an ox with near 100 goats. In the above mentioned valley he ſaw the ſame ſort of hollows in the form of inverted cones, out of which he had been aſſured that hot water mixed with ſand iſſued during the earthquakes as at Roſarno; but, on proper inquiry, no perſon was found who could poſitively declare that the water had really been hot. Some of the ſand which was thrown up had a ferruginous appearance, and ſeemed to have been acted upon by fire. It was ſaid alſo, that, when freſh, this ſand had the ſmell of ſulphur; but this our author could not perceive.

48
All the inhabitants of ſeveral towns buried in an inſtant in the ruins of their houſes.

49
Houſes of Caſal Nuova lifted at once from their foundation.

Paſſing through the ſame beautiful country to the town of Poliſtene, he did not perceive a ſingle houſe ſtanding. "I travelled (ſays he) four days in the plain, in the midſt of ſuch miſery as cannot be deſcribed. The force of the earthquake there was ſo great, that all the inhabitants of the towns were buried, alive or dead, in the ruins of their houſes in an inſtant. The town of Poliſtene was large, but ill ſituated between two rivers that were ſubject to overflow. Two thouſand one hundred, out of 6000, loſt their lives here on the fatal 5th of February." At Caſal Nuova, the princeſs Gerace Grimaldi, with 4000 of her ſubjects, periſhed on the ſame day by the exploſion; for ſuch it appears to have been. Some who had been dug alive out of the ruins, told our author, that they had felt their houſes fairly lifted up, without having the leaſt previous notice. An inhabitant of Caſal Nuova was at that moment on a hill overlooking the plain; when, feeling the ſhock, and turning round, inſtead of the town he ſaw only a thick cloud of white duſt like ſmoke, the natural effect of the cruſhing of the buildings and the mortar flying off.

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The town of Caſal Nuova was ſo effectually deſtroyed by this dreadful ſhock, that neither veſtige of houſe or ſtreet remained, but all lay in one confuſed heap of ruins. Caſtillace and Milicuſco, which our author next viſited, were both in the ſame ſituation. Terra Nuova, ſituated in the ſame plain, ſtood between two rivers, which, with the torrents from the mountains, had, in the courſe of ages, cut deep and wide chaſms in the ſoft ſandy clay ſoil of which it is compoſed. At Terra Nuova the ravine or chaſm is not leſs than 500 feet deep, and three quarters of a mile broad. Here the accounts of the earthquake were confuſed, by not having the ſituation of the place and nature of the ſoil explained. It was ſaid, that a town had been thrown a mile from the place on which it ſtood, without mentioning a word of the ravine; that woods and corn-fields had been removed in the ſame manner, "when in truth (ſays our author) it was but upon a large ſcale, what we ſee every day upon a ſmaller; when pieces of the ſides of hollow ways, having been undermined by rain waters, are detached by their own weight. Here, from the great depth of the ravine, and the violent motion of the earth, two huge portions of the latter, on which a great part of the town ſtood, which conſiſted of ſome hundred houſes, had been detached into the ravine, and nearly acroſs it, at about the diſtance of half a mile from the place where they formerly ſtood; and what is very extraordinary, many of the inhabitants who had taken this ſingular leap in their houſes, were nevertheleſs dug out alive, and ſome unhurt." Our author's guide there, who was both a prieſt and phyſician, having been buried in the ruins of his houſe by the firſt ſhock, was blown out of it and delivered by the ſecond, which immediately followed the firſt; and there were many well atteſted inſtances of the ſame thing having happened in different parts of Calabria. At Terra Nuova, however, only 400 out of 1600 inhabitants were left alive.

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In other parts of the plain, ſituated near the ravine, and near the town of Terra Nuova, our author ſaw many acres of land, with trees and corn-fields, that had been detached into the ravine, frequently without having been overturned; ſo that the crops were growing as well as if they had been planted there. Other ſuch pieces were lying in the bottom in an inclined ſituation; and others again that had been quite overturned. In one place, two of theſe immenſe pieces of land having been detached, oppoſite to one another, had filled the valley, and ſtopped the courſe of the river, the waters of which were forming a great lake; "and this (ſays our author) is the true ſtate of what the accounts mention of mountains that had walked, and joined together, ſtopped the courſe of a river, and formed a lake."

At the moment of the earthquake the river diſappeared as at Roſarno; and returning ſoon after, overflowed the bottom of the ravine about three feet in depth; ſo that the poor people who had been thrown with their houſes into the ravine from the top of it, and had eſcaped with broken bones, were now in danger of being drowned. Our author was aſſured, that the water was ſalt like that of the ſea; but this circumſtance ſeemed to want confirmation. The ſame cauſe, however, given for the ſudden diſappearing of the river Metauro at Roſarno will account for the like phenomenon here, and in every part of the country where the rivers were dried up at the moment of the earthquake.

53 cr- raiſed o an ited ſi- ien.

The whole town of Mollochi di Sotto was likewiſe detached into the ravine, and a vineyard of many acres lay near it in the bottom in perfect order, but in an inclined ſituation. There was a foot-path through this vineyard which had a ſingular effect in its then impracticable ſituation. Some water-mills which were on the river, being jammed between two ſuch detached pieces as above deſcribed, were lifted up by them, and were then to be ſeen on an elevated ſituation many feet above the level of the river.

54 ng of ground me es, and ing in s, ex- ned.

In ſeveral parts of the plain, the ſoil, with timber-trees and crops of corn, conſiſting of many acres, had ſunk eight and ten feet below the level of the plain, and riſen as many in other places. To explain this, it is neceſſary to remember, that the ſoil of the plain is a clay mixed with ſand, which is eaſily moulded into any ſhape. In the plain, near the ſpots where the above mentioned pieces had been detached into the ravine, there were ſeveral parallel cracks; ſo that, had the violence of the earthquake continued, theſe pieces would alſo probably have followed. It was conſtantly remarked by our author, that near every ravine or hollow way, the parts of the plain adjoining were full of large parallel cracks. The earth rocking from ſide to ſide, and being ſupported only on one ſide, accounts very well for this circumſtance.

55 cks in earth, gene- ytermed r ra- es.

56 tting of moun- at Op- ex- ned.

From Terra Nuova our author continued his journey to Oppido. This city ſtands on a mountain of a ferruginous ſort of gritty ſtone, unlike the clay ſoil of its neighbourhood; and is ſurrounded by two rivers in a ravine deeper and broader than that at Terra Nuova. Inſtead of the mountain on which this city ſtands having ſplit, as was reported, and by its fall ſtopped up the courſe of rivers, it was, as at Terra Nuova, huge pieces of the plain on the edge of the ravine, that had been detached into it, had nearly filled it up, and ſtopped the courſe of the rivers, the waters of which were then forming two great lakes. Part of the rock on which the city ſtood was indeed alſo detached, with ſeveral houſes, into the ravine: "But that (ſays our author) is a trifling circumſtance in compariſon of the very great tracts of land with plantations of vines and olives which had been detached from one ſide of the ravine to the other, though the diſtance is more than half a mile. It is well atteſted, that a countryman, who was ploughing his field in this neighbourhood with a pair of oxen, was tranſported with his field and team clear, from one ſide of a ravine to the other, and that neither he nor his oxen were hurt.

57 ountry- de- ed with eat t of acroſs vine.

58 untains lakes ned by earth- kes.

"Having walked over the ruins of Oppido (ſays our author), I deſcended into the ravine, and examined carefully the whole of it. Here I ſaw indeed the wonderful force of the earthquake, which has produced exactly the ſame effects as thoſe deſcribed in the ravine at Terra Nuova, but on a ſcale infinitely greater. The enormous maſſes of the plain, detached from each ſide of the ravine, lie ſometimes in confuſed heaps, forming real mountains, and having ſtopped the courſe of two rivers (one of which is very conſiderable), great lakes are already formed; and if not aſſiſted by nature or art, ſo as to give the rivers their due courſe, muſt infallibly be the cauſe of a general infection in the neighbourhood. Sometimes I met with a detached piece of the ſurface of the plain (of many acres in extent) with the large oaks and olive-trees, with corn or lupins under them, growing as well and in as good order at the bottom of the ravine as their companions from whence they were ſeparated do on their native ſoil, at leaſt 500 feet higher, and at the diſtance of about three quarters of a mile. I met with whole vineyards in the ſame order in the bottom that had likewiſe taken the ſame journey. As the banks of the ravine from whence theſe pieces came are now bare and perpendicular, I perceived that the upper ſoil was a reddiſh earth, and the under one a ſandy white clay, very compact, and like a ſoft ſtone. The impulſe theſe huge maſſes received, either from the violent motion of the earth alone, or that aſſiſted with the additional one of the volcanic exhalations ſet at liberty, ſeems to have acted with greater force on the lower and more compact ſtratum than on the upper cultivated cruſt: for I conſtantly obſerved, where theſe cultivated lands lay, the under ſtratum of compact clay had been driven ſome hundred yards farther, and lay in confuſed blocks; and, as I obſerved, many of theſe blocks were in a cubical form. The under ſoil, having had a greater impulſe, and leaving the upper in its flight, naturally accounts for the order in which the trees, vineyards, and vegetation fell, and remain at preſent in the bottom of the ravine.

59 Obſervations on the ſoil of the detached tracts of land, and the effects of the ſhock upon them.

60 Removal of the hill accounted for.

"In another part of the bottom of the ravine there is a mountain compoſed of the ſame clay ſoil, and which was probably a piece of the plain detached by an earthquake at ſome former period: it is about 250 feet high, and 400 feet diameter at its baſis. This mountain, as is well atteſted, has travelled down the ravine near four miles; having been put in motion by the earthquake of the 5th of February. The abundance of rain which fell at that time, the great weight of the freſh detached pieces of the plain which I ſaw heaped up at the back of it, the nature of the ſoil of which it is compoſed, and particularly its ſituation on a declivity, accounts well for this phenomenon; whereas the reports which came to Naples of a mountain having leaped four miles, had rather the appearance of a miracle. I found ſome ſingle timber-trees alſo with a lump of their native ſoil at their roots, ſtanding upright in the bottom of the ravine, and which had been detached from the bottom of the plain above mentioned. I obſerved alſo, that many confuſed heaps of the looſe ſoil, detached by the earthquake from the plains on each ſide of the ravine, had actually run like a volcanic lava (having probably been aſſiſted by the heavy rain), and produced many effects much reſembling thoſe of lava during their courſe down a great part of the ravine. At Santa Criſtina, near Oppido, the like phenomena have been exhibited, and the great force of the earthquake of the 5th of February ſeems to have been exerted on theſe parts, and at Caſal Nuova, and Terra Nuova."

61 Some parts of the ſoil run like a volcanic lava.

From Oppido Sir William proceeded to the towns of Seminara and Palmi. The former, being ſituated

62
Singular circumſtance of a rivulet of oil by the breaking of the veſſels in Palmi.

63
A ſhock with an exploſion felt by Sir William Hamilton.

64
Fire iſſuing from the earth ſuppoſed to be electric.

higher up, had ſuffered leſs than Palmi which ſtood nearer the ſea. Fourteen hundred lives were loſt at this place, and ſome ſingular circumſtances occurred. The town being a great market for oil, there were upwards of 4000 barrels of that liquid in it at the time of its deſtruction; ſo that by the breaking of theſe barrels and jars, a rivulet of oil ran from the ruins for many hours into the ſea. Here our author was informed by the perſon who conducted him, that he had been buried in the ruins of his houſe by the firſt ſhock; and that after the ſecond, which followed immediately, he found himſelf ſitting aſtride a beam at leaſt 15 feet high in the air. After Sir William's departure from Palmi, in going through one of the narrow paſſes among the mountains of Bagnara and Solano, he felt a very ſmart ſhock of an earthquake attended with a loud exploſion like that of ſpringing a mine; but fortunately it did not detach any rocks or trees from the high mountains which hung over their heads. In this country he was aſſured by ſeveral fiſhermen, that during the earthquake on the 5th of February, at night, the ſea was hot, and that they ſaw fire iſſue from the earth in many parts. This laſt circumſtance was frequently repeated in different parts of the plain, ſo that there ſeems to remain no doubt of its authenticity. The idea of Sir William Hamilton is, that "the exhalations which iſſued during the violent commotions of the earth were full of electrical fire; juſt as the ſmoke of volcanoes conſtantly is during violent eruptions: for I ſaw no mark (ſays he), in any part of my journey, of any volcanic matter having iſſued from the fiſſures of the earth; and I am convinced that the whole has been done by vapours and exhalations only. The firſt ſhock felt at this place, as I was aſſured, was lateral, and then vorticoſe, and exceedingly violent; but what they call violent here muſt have been nothing in compariſon of what was felt in the plain of Caſa Nuova, Poliſtene, Palmi, Terra Nuova, Oppido, &c. &c. where all agreed that the violence of the fatal ſhock of February was inſtantaneous, without warning, and from the bottom upwards."

65
Brute animals ſenſible of the approach of earthquakes.

At Reggio the ſhock had been much leſs violent than in the places hitherto viſited by our author; and "though there was not a houſe in it inhabited or habitable, yet (ſays he) after having been ſeveral days in the plain, where every building is levelled with the ground, a houſe with a roof, or a church with a ſteeple, was to me a new and refreſhing object." In this place he had an account from the archbiſhop of the earthquakes of 1770 and 1780, which obliged the inhabitants, in number 16,400, to encamp or remain in barracks for ſeveral months, without having done any conſiderable damage to the town. He was informed alſo, that all animals and birds are in a greater or leſſer degree much more ſenſible of an approaching ſhock of an earthquake than any human being; but that geeſe, above all, ſeem to be the ſooneſt and moſt alarmed at the approach of a ſhock: if in the water, they quit it immediately; and there are no means of driving them into it for ſome time after. The ſhock which damaged Reggio came on gently, ſo that the people had time to make their eſcape, and only 126 were killed; but in the plain this ſhock was as inſtantaneous as it was violent and deſtructive.

66
Earthqu leſs viol at Meſſi than in Italy.

On the 14th of May, Sir William Hamilton having taken leave of Reggio, ſet ſail for Meſſina, which he viſited next morning; and found that the ſhock, tho' very violent there, had been far inferior to what he had ſeen the effects of in other places. Many houſes, even in the lower part of the town, were ſtanding, and ſome little damaged; but in the upper and more elevated ſituations, the earthquakes ſeemed to have ſcarce had any effect. "A ſtrong inſtance (ſays our author) of this is, that the convent of Santa Barbara, and that called the *Novitiato de Geſniti*, both on an elevated ſituation, have not a crack in them; and that the clock of the latter has not been deranged in the leaſt by the earthquakes, which have afflicted this country for four months paſt, and which ſtill continue in ſome degree."

67
Effects of there.

68
Remarkable circumſtance reſpecting a kind of ſmall fiſhe

69
Extraordinary boilin of the ſea near Meſſina.

Notwithſtanding this comparative mildneſs, however, the ſhock at Meſſina had been very terrible. All the beautiful front of the palazzate, which extended in very lofty uniform buildings, in the ſhape of a creſcent, had been in ſome parts totally ruined, in others leſs; and there were cracks in the earth of the quay, a part of which had ſunk above a foot below the level of the ſea. Theſe cracks were probably occaſioned by the horizontal motion of the earth in the ſame manner as the pieces of the plain were detached into the ravines at Oppido and Terra Nuova; for the ſea at the edge of the quay is ſo very deep, that the largeſt ſhips can lie along ſide. The earth, therefore, in its violent commotion, wanting ſupport on that ſide next the ſea, began to crack and ſeparate; and as where there is one crack there are generally others leſs conſiderable in lines parallel to the firſt, our author ſuppoſes, that the great damage done to the houſes neareſt the quay was owing to ſuch cracks below their foundations. It is ſaid, that during the earthquake fire had been ſeen to iſſue from the cracks of the quay; but our author is perſuaded that this, as in other caſes, was only a vapour charged with electrical fire or a kind of inflammable air. Here alſo he was informed, that the ſhock of the 5th of February had been from the bottom upwards; but the ſubſequent ones generally horizontal or vorticoſe. A remarkable circumſtance was obſerved at Meſſina, and through the whole coaſt of Calabria, which had been moſt affected by the earthquake, *viz.* that a ſmall fiſh called *cicirelli*, reſembling the Engliſh white bait, but larger, and which uſually lie at the bottom of the ſea buried in the ſand, had, ever after the commencement of the earthquakes to the time this account was written, continued to be taken near the ſurface, and that in ſuch abundance as to be common food for the pooreſt ſort of people; whereas before the earthquakes this fiſh was rare, and reckoned among the greateſt delicacies. Fiſh of all kinds alſo were taken in greater abundance on theſe coaſts after the commencement of the earthquakes than before; which our author ſuppoſes to have been occaſioned either by the volcanic matter having heated the bottom of the ſea, or that the continual tremor of the earth had forced them out of their retreats. At Meſſina our author was likewiſe informed, that on the 5th of February, and for three days following, the ſea about a quarter of a mile from the citadel roſe and boiled in an extraordinary manner, and with a moſt horrid and alarming noiſe; the water in other parts of the ſtrait being perfectly calm. "This

(ſays

(ſays our author) ſeems to point out exhalations or eruptions from cracks at the bottom of the ſea, which may very probably have happened during the violence of the earthquakes ; all of which I am convinced have here a volcanic origin."

The next inquiry made by this curious traveller was concerning the great wave which occaſioned ſuch deſtruction at Scilla, as has already been related. Having left Meſſina on the 17th of May, he proceeded in his boat to the entrance of the Faro, where he met with a prieſt who had been there on the night between the 5th and 6th of February, when the wave paſſed over that point of land. Here it carried off boats with 24 people, tore up trees by the roots, and left a conſiderable quantity of fiſh behind it. This prieſt had himſelf been covered by the wave, and with difficulty ſaved his life. He at firſt ſaid the water was hot ; but on being preſſed with other queſtions, it amounted to no more than that the water was as warm as it uſually is in ſummer. The wave, he ſaid, roſe to a great height, and came on with noiſe and ſuch rapidity that it was impoſſible to eſcape.

On croſſing over to Scilla, Sir William was perfectly ſatisfied concerning the nature of this formidable wave, and found that the following was the true ſtate of the fact: "The prince of Scilla having remarked, that during the firſt horrid ſhock, which happened about noon the 5th of February, part of a rock near Scilla had been detached into the ſea ; and fearing that the rock of Scilla, on which his town and caſtle are ſituated, might alſo be detached, he thought it ſafer to prepare boats, and retire to a little port or beach ſeated at the foot of it, and likewiſe ſurrounded by rocks. But the ſecond ſhock of the earthquake about midnight, having detached a whole mountain much higher than that of Scilla, ſituated between the latter and Torre del Cavallo, it fell into the ſea with ſuch violence as to raiſe the fatal wave above mentioned. This having broken on the point of land called *Punto del Faro*, in the manner already related, inſtantly returned with great noiſe and celerity upon the beach, where the unfortunate prince and his ſubjects had taken refuge, and either daſhed them with their boats and effects againſt the rocks, or whirled them into the ſea. Thoſe who had eſcaped the firſt and greateſt wave, were carried off by a ſecond and third leſs conſiderable, but which immediately followed the firſt. Our author ſpoke with many who had been involved in that wave, and violently hurt by it; but all of them agreed in aſſerting that the water was not hot.

The earthquakes were not perfectly ſettled even in 1784, when Sir William Hamilton wrote the account of the ſtate of Veſuvius, &c. to the Royal Society. In a poſtſcript to that letter he adds the following confirmation of his conjecture, that the volcanic matter, which he ſuppoſed to have occaſioned the earthquakes, had vented itſelf at the bottom of the ſea betwixt Calabria and Sicily. "The pilot of one of his Sicilian majeſty's ſciabecques having ſome time after the earthquakes caſt anchor off the point of Palizzi, where he had often anchored in 25 fathom water, found no bottom till he came to 65; and having ſounded for two miles out at ſea towards the point of Spartivento in Calabria, he ſtill found the ſame conſiderable alteration in the depth. The inhabitants of Palizzi likewiſe declare, that during the great earthquake on the 5th of February 1783, the ſea had boiled and frothed up tremendouſly off their point."

74 Hypotheſes concerning the cauſe of earthquakes.

To explain the phenomena of earthquakes, various hypotheſes have been invented. Till lately, the hypotheſes of modern philoſophers were much the ſame with thoſe of the ancients. Anaxagoras ſuppoſed the cauſe of earthquakes to be ſubterraneous clouds burſting out into lightning, which ſhook the vaults that confined them. Others imagined, that the arches, which had been weakened by continual ſubterraneous fires, at length fell in. Others derived theſe accidents from the rarefied ſteam of waters, heated by ſome neighbouring fires ; and ſome, among whom was Epicurus, and ſeveral of the Peripatetic ſchool, aſcribed theſe terrible accidents to the ignition of certain inflammable exhalations.

This laſt hypotheſis has been adopted by many of the moſt celebrated moderns, as Gaſſendus, Kircher, Schottus, Varenius, Des Cartes, Du Hamel, Honorius, Fabri, &c. The philoſopher laſt mentioned indeed ſuppoſed, that waters prodigiouſly rarefied by heat might ſometimes occaſion earthquakes. The others ſuppoſed, as their hypotheſis neceſſarily requires, that there are many and vaſt cavities underground which have a communication with one another: ſome of which abound with waters; others with vapours and exhalations, ariſing from inflammable ſubſtances, as nitre, bitumen, ſulphur, &c. Theſe combuſtible exhalations they ſuppoſed to be kindled by a ſubterraneous ſpark, or by ſome active flame gliding through a narrow fiſſure from without, or by the fermentation of ſome mixture ; and when this happened, they muſt neceſſarily produce pulſes, tremors, and ruptures at the ſurface, according to the number and diverſity of the cavities, and the quantity and activity of the inflammable matter. This hypotheſis is illuſtrated by a variety of experiments, ſuch as mixtures of iron-filings and brimſtone buried in the earth, gun-powder confined in pits, &c. by all which a ſhaking of the earth will be produced.

75 Hypotheſis of Dr Woodward.

Dr Woodward ſuggeſts another hypotheſis. He ſuppoſes that the ſubterraneous heat or fire, which is continually elevating water out of the abyſs, which, according to him, occupies the centre of the earth, to furniſh rain, dew, ſprings, and rivers, may be ſtopped in ſome particular part. When this obſtruction happens, the heat cauſes a great ſwelling and commotion in the waters of the abyſs; and at the ſame time, making the like effort againſt the ſuperincumbent earth, that agitation and concuſſion of it is occaſioned which we call an earthquake.

76 Of Mr Amontons.

Mr Amontons of the Royal Academy of Sciences ſuggeſts an hypotheſis entirely different from any of the above mentioned ones. According to the received philoſophical principles, which ſuppoſe the atmoſphere to be about 45 miles high, and that the denſity of the air increaſes in proportion to the abſolute height of the ſuperincumbent column of fluid; it is ſhown, that at the depth of 43,528 fathoms below the ſurface of the earth, air is but one-fourth lighter than mercury. Now, this depth of 43,528 fathoms is only

only a 74th part of the ſemidiameter of the earth; and the vaſt ſphere beyond this depth, in diameter 6,451,538 fathoms, may probably be only filled with air; which will be here greatly condenſed, and much heavier than the heavieſt bodies we know of in nature. But it is found by experiment, that the more air is compreſſed, the more does the ſame degree of heat increaſe its ſpring, and the more capable does it render it of a violent effect; and that, for inſtance, the degree of heat of boiling water increaſes the ſpring of the air above what it has in its natural ſtate, in our climate, by a quantity equal to a third of the weight wherewith it is preſſed. Whence we may conclude, that a degree of heat, which on the ſurface of the earth will only have a moderate effect, may be capable of a very violent one below. And as we are aſſured, that there are in nature degrees of heat much more conſiderable than that of boiling water, it is very poſſible there may be ſome, whoſe violence, further aſſiſted by the exceeding weight of the air, may be more than ſufficient to break and overturn this ſolid orb of 43,528 fathoms; whoſe weight, compared to that of the included air, would be but a trifle.

77 All theſe hypotheſes rejected by Dr Stukely.

Though none of theſe hypotheſes were ſufficient for explaining the phenomena of earthquakes in a ſatisfactory manner, one or other of them continued to be adopted by almoſt all philoſophers till the year 1749. In the month of March that year, an earthquake was felt at London and ſeveral other places in Britain. Dr Stukely, who had been much engaged in electrical experiments, began to ſuſpect that phenomena of this kind ought to be attributed not to vapours or fermentations generated in the bowels of the earth, but to electricity. In a paper publiſhed by him on this ſubject, he rejects all the above mentioned hypotheſes for the following reaſons.

1. That there is no evidence of any remarkable cavernous ſtructure of the earth; but that, on the contrary, there is rather reaſon to preſume that it is in a great meaſure ſolid, ſo as to leave little room for internal changes and fermentations within its ſubſtance; nor do coal-pits, he ſays, when on fire, ever produce any thing reſembling an earthquake.

2. In the earthquake at London, in March 1749, there was no ſuch thing as fire, vapour, ſmoke, ſmell, or an eruption of any kind obſerved, though the ſhock affected a circuit of 30 miles in diameter. This conſideration alone of the extent of ſurface ſhaken by an earthquake, he thought ſufficient to overthrow the ſuppoſition of its being owing to the expanſion of any ſubterraneous vapours. For as ſmall fire-balls burſting in the air propagate a ſulphureous ſmell to the diſtance of ſeveral miles, it cannot be ſuppoſed, that ſo immenſe a force acting inſtantaneouſly on that compaſs of ground ſhould never break the ſurface of it, nor become diſcoverable either to the ſight or the ſmell: beſides, that the operation of ſuch a fermentation would be many days in continuance, and the evaporation of ſo much inflammable matter would require a long ſpace of time. That ſuch an effect, therefore, ſhould be produced inſtantaneouſly, can be accounted for by electricity only; which acknowledges no ſenſible tranſition of time, no bounds.

3. If vapours and ſubterraneous fermentations, exploſions and eruptions, were the cauſe of earthquakes, they would abſolutely ruin the whole ſyſtem of ſprings and fountains, wherever they had once been; which is contrary to fact, even when they have been frequently repeated. Even in the earthquake in Aſia Minor, A. D. 17, which deſtroyed 13 great cities, and ſhook a maſs of earth 300 miles in diameter, nothing ſuffered but the cities; neither the ſprings nor the face of the country being injured, which indeed remains the ſame to this day.

4. That any ſubterraneous power ſufficient to move 30 miles in diameter, as in the earthquake which happened at London, muſt be lodged at leaſt 15 or 20 miles below the ſurface; and therefore muſt move an inverted cone of ſolid earth, the baſe of which is 30 miles in diameter, and the axis 15 or 20; an effect impoſſible to any natural power whatever, except electricity. So in Aſia Minor, ſuch a cone muſt have been 300 miles in the diameter of the baſe, and 200 in the axis; which not all the gun-powder that has been made ſince the invention of it, much leſs any vapours generated ſo far below the ſurface, could poſſibly effect.

5. A ſubterraneous exploſion will not account for the manner in which ſhips, far from land, are affected during an earthquake; which ſeem as if they ſtruck upon a rock, or as if ſomething thumped againſt their bottoms. Even the fiſhes are affected. A ſubterraneous exploſion would only produce a gradual ſwell, and not give ſo quick an impulſe to the water as would make it feel like a ſtone.

78 His me of accou ing for earthquakes.

From comparing theſe circumſtances, the Doctor ſays, he had always thought that an earthquake was a ſhock of the ſame kind as thoſe which commonly occur in electrical experiments. And this hypotheſis was confirmed by the phenomena attending earthquakes; particularly thoſe of 1749 and 1750, which gave riſe to his publication.

The weather, for five or ſix months before, had been uncommonly warm; the wind ſouth and ſouth-weſt, without rain; ſo that the earth muſt have been in a ſtate peculiarly ready for an electrical ſhock. The flat country of Lincolnſhire had been under an exceeding great drought. The uncommonneſs of the firſt of theſe circumſtances, he remarks, is the reaſon why earthquakes are leſs frequently experienced in the northern than in the ſouthern regions of the world, where the warmth and dryneſs of the air, ſo neceſſary to electricity, are more uſual: And the latter ſhows how fit the dry ſurface was for an electrical vibration; and (which is of great importance) that earthquakes reach but little below the ſurface of the earth.

Before the earthquake at London, all vegetables had been uncommonly forward. And electricity is well known to quicken vegetation. The aurora borealis had been frequent about that time; and juſt before the earthquake, had been twice repeated in ſuch colours as had never been ſeen before. It had alſo removed ſoutherly, contrary to what is common in England; ſo that the Italians, and thoſe among whom earthquakes were frequent, actually foretold the earthquake. The year had been remarkable for fire-balls, lightning, and coruſcations; and theſe are rightly judged to be meteors of an electrical nature.

In theſe circumſtances of the earth and air, nothing, he ſays, is wanting to produce an earthquake, but the touch of ſome non-electric body; which muſt neceſſarily be had *ab extra* from the region of the air or atmoſphere. Hence he infers, that if a non-electric cloud diſcharge its contents upon any part of the earth, in that highly electrical ſtate, an earthquake muſt neceſſarily enſue. As the diſcharge from an excited tube produces a commotion in the human body, ſo the diſcharge of electric matter from the compaſs of many miles of ſolid earth muſt needs be an earthquake; and the ſnap from the contact, the horrid uncouth noiſe attending it.

The Doctor had been informed by thoſe who were up and abroad the night preceding the earthquake, and early in the morning, that coruſcations in the air were extremely frequent; and that a little before the earthquake, a large and black cloud ſuddenly covered the atmoſphere, which probably occaſioned the ſhock by the diſcharge of a ſhower.

A ſound was obſerved to roll from the Thames towards Temple Bar before the houſes ceaſed to nod, juſt as the electrical ſnap precedes the ſhock. This noiſe (which generally precedes earthquakes) the Doctor thought could be accounted for only on electrical principles: for, in a ſubterraneous eruption, the direct contrary would happen.

The flames and ſulphureous ſmells, which are ſometimes obſerved in earthquakes, might, he thought, be more eaſily accounted for, on the ſuppoſition of their being electrical phenomena, than from their being occaſioned by eruptions from the bowels of the earth. So alſo the ſuddenneſs and expedition of the concuſſion, it being felt at the ſame inſtant over ſuch a large ſurface, and the little damage alſo which earthquakes generally occaſion; ſufficiently point out what ſort of a motion it is: not a convulſion of the bowels of the earth; but an uniform vibration along its ſurface, like that of a muſical ſtring, or a glaſs when rubbed on the edge with one's finger.

The circumſtance of earthquakes chiefly affecting the ſea-coaſt, places along rivers (and, adds Doctor Prieſtley, eminences), is a farther argument of their being electrical phenomena. This is illuſtrated by a particular account of the direction in which the earthquake was conveyed.

The laſt argument he uſes is taken from the effects which it had on perſons of weak conſtitutions, who were, for a day or two after it happened, troubled with pains in the back, rheumatiſms, hyſterics, and nervous diſorders; juſt in the ſame manner as they would have been after an actual electrification: to ſome theſe diſorders proved fatal.

As to the manner in which the earth and atmoſphere are put into this ſtate, which prepares them to receive ſuch a ſhock, and whence the electric matter comes, the Doctor does not pretend to determine; but thinks it as difficult to be accounted for as magnetiſm, gravitation, and many other ſecrets of nature.

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The ſame hypotheſis was advanced by Signior Beccaria, without knowing any thing of Dr Stukeley's diſcoveries. But this learned Italian imagined the electric matter which occaſions earthquakes to be lodged deep in the bowels of the earth, agreeably to his hypotheſis concerning lightning.

Now, as it appears that the quantity of electric matter in the ſimpleſt thunder-ſtorms is ſo inconceivably great, that it is impoſſible to be contained by any cloud or number of clouds; and as, during the progreſs of a thunder-ſtorm which he obſerved, though the lightning frequently ſtruck to the earth, the ſame clouds were the next moment ready to make a ſtill greater diſcharge; it was evident, that they muſt have received at one place, the moment a diſcharge was made from them in another. Let us ſuppoſe theſe clouds ever ſo great, if the lightning proceeded only from them, the quantity muſt be leſſened by every diſcharge; and no recruits that any new clouds might bring can bear any proportion to the diſcharge which muſt enſue from the colliſion of ſo great a number as combine to form a thunder-ſtorm. It ſeems therefore moſt likely, that the electric matter is continually darting from the clouds in one place, at the ſame time that it is diſcharged from the earth in another; and, conſequently, that the clouds ſerve as conductors to convey the electric fluid from thoſe places of the earth which are overloaded with it, to thoſe which are exhauſted.

This theory being admitted, there will, he thinks, be little difficulty in attributing earthquakes to the ſame cauſe. For if the equilibrium of the electric matter be by any means loſt in the bowels of the earth; ſo that the beſt method of reſtoring it ſhall be by the fluid burſting into the air, and traverſing ſeveral miles of the atmoſphere, to come at the place where it is wanted; it may be eaſily imagined, that violent concuſſions will be given to the earth by the ſudden paſſage of ſo powerful an agent. This, in his opinion, was confirmed by the flaſhes of light, exactly reſembling lightning, which have been frequently ſeen to ruſh from the top of Mount Veſuvius, at the time that aſhes and other light matters have been carried out of it into the air, and diſperſed uniformly over a large tract of country. And it is well known, that volcanoes have a near connection with earthquakes.

A rumbling noiſe like thunder, and flaſhes of light riſing from the ground, have been generally obſerved to attend earthquakes. And lightning itſelf has been known to be attended with ſmall ſhakings of the earth. So alſo *ignes fatui*, in mines, he looked upon as an argument that the electric fluid was ſometimes collected in the bowels of the earth.

80
Of Dr Prieſtley.

Dr Prieſtley, in his Hiſtory of Electricity, obſerves upon theſe theories, that a more probable hypotheſis may perhaps be formed out of both of them. "Suppoſe (ſays he) the electric matter to be, ſome way or other, accumulated on one part of the ſurface of the earth, and on account of the dryneſs of the ſeaſon not eaſily to diffuſe itſelf; it may, as Signior Beccaria ſuppoſes, force its way into the higher regions of the air, forming clouds in its paſſage out of the vapours which float in the atmoſphere, and occaſion a ſudden ſhower, which may further promote the paſſage of the fluid. The whole ſurface, thus unloaded, will receive a concuſſion, like any other conducting ſubſtance, on parting with, or receiving a quantity of the electric fluid. The ruſhing noiſe will likewiſe ſweep over the whole extent of the country. And upon this ſuppoſition alſo, the fluid, in its diſcharge from the country, will naturally follow the courſe of the rivers, and alſo take the advantage of any eminences to facilitate its aſcent into the higher regions of the air."

The Doctor, making experiments with a battery on the paſſage of the electrical fluid over different conducting ſubſtances, and, among theſe, over water;—and remarking a reſemblance between its paſſage over the ſurface of the water, and that which Dr Stukeley ſuppoſed to ſweep the ſurface of the earth, when a conſiderable quantity of it is diſcharged to the clouds during an earthquake; immediately ſuſpected that the water over which it paſſed, and which was viſibly thrown into a tremulous motion, muſt receive a concuſſion reſembling that which is given to the waves of the ſea on ſuch an occaſion.

To try this, he himſelf and others preſent put their hands into the water at the time that the electrical flaſh paſſed over its ſurface; and they felt a ſudden concuſſion given to them, exactly like that which is ſuppoſed to affect ſhips at ſea during an earthquake. This percuſſion was felt in various parts of the water, but was ſtrongeſt near the place where the exploſion was made. The ſame experiment, with a little variation, being afterwards made with a ſingle jar, at ſome diſtance below the ſurface of the water, produced the like effect, though in a weaker degree. "This ſimilarity in the effect (the Doctor obſerves) is a conſiderable evidence of a ſimilarity in the cauſe.

"Pleaſed with this reſemblance of the earthquake (ſays he), I endeavoured to imitate that great natural phenomenon in other reſpects: and it being froſty weather, I took a plate of ice, and placed two ſticks about three inches high on their ends, ſo that they would juſt ſtand with eaſe; and upon another part of the ice I placed a bottle, from the cork of which was ſuſpended a braſs ball with a fine thread. Then, making the electrical flaſh paſs over the ſurface of the ice, which it did with a very loud report, the nearer pillar fell down, while the more remote ſtood; and the ball which had hung nearly ſtill, immediately began to make vibrations about an inch in length, and nearly in a right line from the place of the flaſh.

"I afterwards diverſified this apparatus, erecting more pillars, and ſuſpending more pendulums, &c. ſometimes upon bladders ſtretched on the mouth of open veſſels, and at other times on wet boards ſwimming in a veſſel of water. This laſt method ſeemed to anſwer the beſt of any: for the board repreſenting the earth, and the water the ſea, the phenomena of them both during an earthquake may be imitated at the ſame time; pillars, &c. being erected on the board, and the electric flaſh being made to paſs either over the board, over the water, or over them both."

81 Deficiency of all theſe hypotheſes.

Theſe three hypotheſes concerning the cauſe of earthquakes, though ſomewhat differing from one another, yet agree in the main; but if a particular ſolution of the phenomena is required, every one of them will be found deficient.

If, according to Dr Stukeley's hypotheſis, the electric matter is lodged only on the ſurface of the earth, or but at a ſmall depth below, how are we to account for thoſe violent effects which often take place in the bowels of the earth? In the earthquake at Liſbon, a large quay ſunk to an unfathomable depth. We are certain that the cauſe of the earthquake muſt have been below this depth, however great it was, and have opened the earth for an immenſe way downwards. At the ſame time an hill in Barbary clave aſunder, and the two halves of it fell different ways. This ſhows, that the cauſe of the earthquake operated not on the ſurface of the hill, but on the ſolid foundation and contents of it; nor can it be explained by any ſuperficial action whatever. From what the miners at Eyam bridge in Derbyſhire obſerved, it is alſo evident, that the ſhock was felt at the depth of 396 feet below the ſurface of the ground more than at the ſurface itſelf; and conſequently there is all the reaſon in the world to think that the cauſe lay at a depth vaſtly greater.

Again, though the earthquake at London was ſuppoſed to begin with a black cloud and ſhower; yet in that of 1755, the effects of which were incomparably greater, the air was calm and ſerene almoſt in every place where it was felt. It doth not appear that there is at any time a conſiderable difference between the electricity of the atmoſphere and that of the earth, or indeed that there can be ſo. For if the earth is electrified *plus* and the atmoſphere *minus*, there are innumerable points on the ſurface of the earth which muſt be imperceptibly drawing off the ſuperfluous electric matter into the air. The vapours alſo, with which the atmoſphere abounds, would always be ready in the ſame ſervice; and thus thunder and lightning might indeed ſometimes be produced, but not earthquakes. But laſtly, neither the air nor the earth does always ſhow any remarkable ſigns of electricity before earthquakes happen. For, the ſummer before the earthquake at Mancheſter in 1777, there had ſcarce been any thunder, lightning, or other ſigns of electricity in the atmoſphere, and vegetation had been extremely backward; and, according to the beſt accounts, the weather continued remarkably fine.

For theſe reaſons, Dr Stukeley's hypotheſis ſeems not to be ſatisfactory. That of Signior Beccaria is not indeed liable to the above mentioned objections; but ſeems highly improbable on another account. The atmoſphere is known to be a ſubſtance through which the electric matter makes its way with the utmoſt difficulty. It is a vaſtly worſe conductor than water or than moiſt earth. If therefore the equilibrium of this fluid is loſt in the bowels of the earth, it is impoſſible to give a reaſon why it ſhould not rather go to the places where it is wanted through the earth itſelf, than through the atmoſphere. Beſides, if this was the caſe, the ſhock of an earthquake could only be felt at thoſe places where the electric fluid iſſued from the earth, and where it entered. All the intermediate places ought to be free from any ſhock, and to be ſenſible only of a violent concuſſion in the atmoſphere; but of this we have no example in any hiſtory of earthquakes whatever.

Dr Prieſtley's hypotheſis is liable to the ſame objections with that of Dr Stukeley; for any ſuperficial operation will never account for thoſe effects above mentioned, which take place at great depths below the ſurface. His experiment cannot be admitted as any way concluſive with regard to the cauſe of earthquakes, becauſe no quantity of electric fire is ſeen to paſs over the

the earth and ſea, like the flaſh attending the exploſion of an electric battery; and the force of his earthquake (being but juſt able to throw down a ſtick that could hardly ſtand by itſelf) ſeems by far too little. The utmoſt force of electricity which man can raiſe, is indeed very trifling, when compared with the great operations of nature: but it is certain, that the force of an electric battery is by no means contemptible; and was its whole power to be employed in producing an imitation of an earthquake, it certainly would do much more than throw down a ſmall ſtick. The bad ſucceſs of this experiment therefore ſhows, that the Doctor's theory is erroneous: for almoſt the whole of his electric power was ſpent another way; and we cannot ſuppoſe that any conſiderable part of the force which produces earthquakes is ſpent any other way than in the very production of the earthquake itſelf.

If it is attempted to give an explanation of the phenomena of earthquakes, which ſhall be free from the objections above mentioned, and from all others, it will be neceſſary, in the firſt place, to conſider thoſe parts of the ſyſtem of nature which ſeem to be moſt affected during the terrible phenomena we treat of. Theſe parts are, the air, the ſolid earth, and the water. Of theſe the two former are electrics *per ſe*; the latter is a conductor, though a bad one *. Hence it follows,

1. That in proportion to the quantity of earth which is mixed with any quantity of water, that mixture will approach nearer to the nature of an electric *per ſe*, and *vice verſa*.

2. It alſo follows, that whatever quantity of electricity is communicated to the ſolid earth, will be quickly taken off from it by the water which is mixed with it, in the ſame manner that the electric matter is carried off from an excited globe by a metallic conductor.

3. The whole earth is moiſt, and therefore in ſome degree a conductor. Nevertheleſs, as earth of all kinds, when perfectly dry, is found to be an electric capable of receiving a charge like glaſs, it is therefore poſſible, that the electric power of the earth may be excited to ſuch a degree, that the moiſture of the ſolid parts cannot eaſily contain the quantity of electricity communicated.

4. In this caſe, the earth muſt either give undoubted ſigns of its being excited in the ſame manner that other excited electrics do, or the electricity muſt be diſcharged ſomewhere elſe.

5. To receive any ſuperfluous quantity of electric matter that may be communicated to the ſolid earth, the waters of the ocean are always ready. Theſe, being a much better conductor than earth, muſt be a principal mean of preſerving the equilibrium of electricity in the different parts of the earth; and hence we ſee a natural reaſon why the waters of the ocean ſhould cover ſo large a proportion of the globe as they are known to do. See OCEAN.

6. It is known, that fire is alſo a conductor of electricity. Therefore, wherever a quantity of electric matter is collected in any part of the ſolid earth, if it can neither be conveniently received by the moiſture which the earth naturally contains, nor by the ocean in its neighbourhood, it will diſcharge itſelf by any volcano that happens to be in an active ſtate, near the place where that collection of electric matter is.

7. It is alſo found, that the electric fluid, being violently reſiſted by the ſuperincumbent atmoſphere, hath always a tendency to diſcharge itſelf in thoſe places where that reſiſtance is leaſt. The tops of high mountains, therefore, where the weight of the atmoſphere is greatly diminiſhed, will alſo afford a ready paſſage for the electric fluid when it is collected in very great quantity in the bowels of the earth.

8. If, from ſome natural cauſes, the electric matter ſhall happen to be collected in the bowels of the earth in any particular place, and at the ſame time ſuch obſtacles are thrown in its way, that it can neither diſcharge itſelf into the ocean, nor into the atmoſphere by the tops of high mountains, nor by the more open paſſages of volcanoes; the moſt terrible conſequences muſt enſue: the matter being pent up, and the cauſe by which it is collected continuing ſtill to act, its impulſe becomes at laſt irreſiſtible. It then flies againſt every obſtacle with inconceivable violence. It breaks out in all thoſe places where there is the leaſt reſiſtance, and therefore the ſhock is directed a great number of different ways at once. Houſes, ſteeples, trees, &c. by their height take off ſomewhat of the preſſure of the atmoſphere; and therefore the electric matter flies againſt them very violently. The houſes and other buildings being bad conductors, are thrown down; the trees affording a readier paſſage to the fluid are not hurt, though even they alſo are ſometimes ſplit. The height of the mountains renders them the objects of the deſtructive force of this fluid much more than any buildings whatever. Hence they are often rent, and rocks thrown down from them. The water contained in the ſolid parts of the earth, being a conductor of electricity, becomes overloaded with it; and when it can receive no more, is forced to yield to the impulſe of the reſt, and therefore is thrown out of the earth in great quantities. For the ſame reaſon, the waters on the ſurface of the earth are moſt violently agitated. The ſmall quantities contained in wells are thrown out at the tops of them: The rivers and lakes, which contain too great a quantity of water to be thrown off from the earth, riſe in billows: The ocean itſelf, receiving more electric matter than can be immediately diſperſed through the whole body of water, or evaporate into the atmoſphere, retreats from the land, and is raiſed in vaſt mountains. The ſolid earth, being unable either to conduct the fluid quietly to thoſe parts where it is wanted, or to retain it, is violently ſhaken or rent in multitudes of places; and this not only on the ſurface, but to great depths. The electricity being now in ſome meaſure diſcharged from the earth, the ocean ruſhes forward with fury to diſcharge in its turn the exceſs of electric matter it juſt before received from the earth. If there are volcanoes in the neighbourhood, the violent diſcharge of electricity is ſure to manifeſt itſelf by ſetting them in a flame; and thus, till the equilibrium is reſtored, all nature ſeems to be threatened with diſſolution.—Even in thoſe places where the force of the electric fluid is not able to ſhake the ſolid parts of the earth, it manifeſts its power by agitating the waters in the manner above deſcribed. Water being a much better conductor of electricity than earth, this ſubtile fluid, as ſoon as it can get out from the ſolid earth, flies to the water. The conſequence is, that the water immediately ſwells up, and is

is attracted by whatever part of the earth has leſs electricity than itſelf. Hence thoſe ſtrange irregular motions of the waters in different places, ſo particularly obſerved at the time of the earthquake at Liſbon; and which it ſeems impoſſible to account for from any other cauſe than an immediate diſcharge of electric matter from the earth into them.

9. As it is impoſſible that any part of the earth can be electrified without communicating a proportionable ſhare of electricity to the animals that live upon it, and have a conſtant communication with it, it thence follows, that there can be no conſiderable commotion in the electric matter lodged in the bowels of the earth, without affecting that which is contained in the bodies of the animals. Hence the brutes, who ſeem to be more ſenſible of ſuch commotions than we, run about, and ſhow ſigns of fear, before the earthquake comes on; and hence the giddineſs, ſickneſs, &c which the human race are ſubject to during the time of the ſhock, even though they do not feel it, as was the caſe at Gibraltar.

10. As the atmoſphere hath a communication with the earth, it is ſcarce to be ſuppoſed that the earth can, for any length of time, contain a conſiderable quantity of electric matter, without communicating to the atmoſphere a proportionable quantity. Before an earthquake, therefore, we muſt ſuppoſe the electricity of the earth and air to be in perfect equilibrio. Hence the weather is ſerene, there is no wind, nor any other ſign in the atmoſphere, of the terrible cataſtrophe that is about to enſue. But the moment the diſcharge is made from the earth, the equilibrium between the terreſtrial and atmoſpherical electricity is broken; the air either begins to receive the fluid from the earth, or the earth from the air. As there is not then time for the collection of thunder-clouds by which the electricity may be brought down in ſudden flaſhes of lightning, the fluid breaks through the ſubſtance of the air itſelf with diſmal and horrid noiſes, which always accompany an earthquake. That this is the caſe, ſeems highly probable from an experiment of M. de Romas, when, having brought down a vaſt quantity of electric matter from the clouds by means of a kite, he heard the noiſe it made in the air, like the continual blowing of a ſmall forge bellows. In general, a conſiderable change of weather takes place at the time of an earthquake, though not always. In the earthquake which happened in England in 1777, there was no remarkable change of weather there; but, ſoon after, there was a great deal of thunder and lightning in the ſouthern parts of Scotland: which ſeems to indicate, that the electric fluid diſcharged from the earth in England had taken its courſe northward, and produced the phenomena before mentioned in Scotland. The ſame obſervation may likewiſe be made with regard to 1789, when there were ſlight ſhocks of an earthquake both in England and Scotland. That in England being the firſt, was followed by an uncommon frequency of thunder and lightning in the ſouthern parts of Scotland; by reaſon of the progreſs of the electric matter northward after it was diſcharged into the atmoſphere: but the ſhocks which happened in the northern part of Scotland (*viz.* about Crief in Stirlingſhire) were not followed by any thunder to the ſouthward; becauſe the electric matter, though diſcharged into the atmoſphere, cannot return to the ſouth without firſt going north, and riſing up into the higher regions.

83
Circumſtances i the earth quakes o 1783 ſeemingly o ſite to th theory.

In the earthquakes in Calabria, in the year 1783, there were ſome circumſtances which ſeem to militate againſt the theory juſt now laid down. The moſt remarkable of theſe is their attacking the places ſituated on the plain much more than thoſe which ſtood on the higher grounds. This is particularly inſiſted upon by Sir William Hamilton. "If two towns (ſays he) were ſituated at an equal diſtance from the centre (of the force of the earthquake), the one on a hill, the other on the plain or in a bottom, the latter always ſuffered greatly more from the ſhocks of the earthquake than the former; a ſufficient proof to me of the cauſe coming from beneath, as this muſt naturally have been productive of ſuch an effect. And I have reaſon to believe, that the bottom of the ſea, being ſtill nearer the volcanic cauſe, would be found, if it could be ſeen, to have ſuffered ſtill more than the plain itſelf: but the philoſophers, who do not eaſily abandon their ancient ſyſtems, make the preſent earthquakes to proceed from the high mountains of the Apennines that divide Calabria Ultra, ſuch as the Monte Dejo, Monte Caulone, and Aſpramonte. I would aſk them this ſimple queſtion, Did the Eolian or Lipari iſlands (all which roſe undoubtedly from the bottom of the ſea by volcanic exploſions, at different and perhaps very diſtant periods) owe their birth to the Apennines in Calabria, or to veins of minerals in the bowels of the earth and under the bottom of the ſea? Stromboli, an active volcano, and probably the youngeſt of thoſe iſlands, is not above 50 miles from thoſe parts of Calabria that have ſuffered moſt by the late earthquakes. The vertical ſhocks, or, in other words, thoſe whoſe impulſe was from the bottom upwards, have been the moſt deſtructive to the unhappy towns in the plain. Did they proceed from Monte Dejo, Monte Caulone, or Aſpramonte? In ſhort, the idea I have of the preſent local earthquakes is, that they have been cauſed by the ſame kind of matter that gave birth to the Eolian iſlands; that perhaps an opening may have been made at the bottom of the ſea, and moſt probably between Stromboli and Calabria Ultra; for from that quarter all agree that the ſubterraneous noiſes ſeem to have proceeded; and that the foundation of a new iſland or volcano may have been laid, though it may be ages, which to nature are but moments, before it is completed and appears above the ſurface of the ſea. Perhaps, too, the whole deſtruction I have been deſcribing may have proceeded ſimply from the exhalations of confined vapours generated by the fermentation of ſuch minerals as produce volcanoes, which have eſcaped where they meet with the leaſt reſiſtance, and muſt naturally, in a greater degree, have affected the plain than the high and ſolid grounds around it."

84
This ea q ake [illegible] Apen mou ta than elſ where.

85
Sir W Ha [illegible] the cau

86
Electri [illegible] ſhare i [illegible] quake

In a memoir on this earthquake by M. Dolomieu, that author endeavours to exclude electricity from having had any ſhare in the matter. "The ſea (ſays he), during the earthquakes of 1783, had little ſhare in the ſhocks of the main land. The maſs of water experienced no general movement of fluctuation or oſcillation; the waves did not riſe above their ordinary limits. Thoſe which, on the night of the 5th of February, beat againſt the coaſt of Scilla, and which af-h- ce.

terwards covered the point of the Faro of Meſſina, were only the effects of a particular cauſe. The fall of a mountain into the ſea raiſed the waters, which received an undulating motion, as happens always in ſimilar caſes. The undulation reached from the point of Sicily beyond the Cape of Roſacolmo, extending in length along the coaſt which runs to the ſouth; but always with a decreaſe in elevation as it was more remote from Sicily. Whatever inquiries the author has made, he has not been able to diſcover, in all the details which have been given him, any proofs of the exiſtence of electrical phenomena: no ſpark, no diſengagement of the electrical fluid, which the Neapolitan naturaliſts wiſh to aſſign as the cauſe of earthquakes.

ſtate at- ere.

"The ſtate of the atmoſphere was not the ſame in the whole range of earthquakes. While the tempeſts and the rain ſeemed to have conſpired with them for the deſtruction of Meſſina, the interior part of Calabria enjoyed very fine weather. A little rain fell in the plain in the morning of the 5th of February; but the ſky was clear during the reſt of the day. This month and that of March were not only pretty ſerene, but likewiſe warm. There were ſome ſtorms and rain; but they were the natural attendants of the ſeaſon.

3 ra- fire ſed the

"The moving force ſeems to have reſided under Calabria itſelf, ſince the ſea which ſurrounds it had no ſhare in the oſcillations or vibrations of the continent. This force ſeems alſo to have advanced along the ridge of the Apennines in aſcending from the ſouth to the north. But what power in nature is capable of producing ſuch effects? I exclude electricity, which cannot accumulate continually during the courſe of a year, in a country ſurrounded with water, where every thing conſpires to place this fluid in equilibrio. Fire remains to be conſidered. This element, by acting directly upon the ſolids, can only dilate them; then their expanſion is progreſſive, and cannot produce violent and inſtantaneous movements. When fire acts upon fluids, ſuch as air and water, it gives them an aſtoniſhing expanſion; and we know that then their elaſtic force is capable of overcoming the greateſt reſiſtances. Theſe appear the only means which nature could employ to operate the effects we ſpeak of; but in all Calabria there is no veſtige of a volcano; nothing to point out any interior combuſtion; no fire concealed in the centre of mountains, or under their baſe; a fire which could not exiſt without ſome external ſigns. The vapours dilated, the air rarefied by a heat conſtantly active, muſt have eſcaped through ſome of the crevices or clefts formed in the ſoil; they muſt there have formed currents. Both flame and ſmoke muſt have iſſued by ſome one or other of theſe paſſages. Theſe once opened, the preſſure would have ceaſed; the force not meeting with any more reſiſtance, would have loſt its effect; and the earthquakes could have no longer continued. None of theſe phenomena took place: we muſt then renounce the ſuppoſition of a combuſtion acting directly under Calabria. Let us ſee if having recourſe to a fire at ſome diſtance from this province, and acting upon it only as an occaſional cauſe, we ſhall be able to explain all the phenomena which have accompanied the ſhocks. Let us take for example Ætna in Sicily, and ſuppoſe large cavities under the mountains of Calabria; a ſuppoſition which *cannot be refuſed*. It is certain that immenſe ſubterraneous cavities do exiſt, ſince Ætna, in elevating itſelf by the accumulation of its exploſions, muſt leave in the heart of the earth cavities proportioned to the greatneſs of the maſs.

87 Whence a ſupply of water ſufficient to produce ſuch effects might be derived.

"The autumn of 1782 and the winter of 1783 were very rainy. The interior waters, augmented by thoſe of the ſurface, may have run into thoſe caverns which form the focus of Ætna: there they muſt have been converted into vapour capable of the higheſt degree of expanſion, and muſt have preſſed forcibly againſt every thing which oppoſed their dilatation. If they found canals to conduct them into the cavities of Calabria, they could not fail to occaſion there all the calamities of which I have given the deſcription.

"If the firſt cavity is ſeparated from the ſecond by a wall (ſo to ſpeak) or ſome ſlight diviſion, and this ſeparation is broken down by the force of the elaſtic vapour, the whole force will act againſt the bottom and ſides of the ſecond. The focus of the ſhocks will appear to have changed place, and become weaker in the ſpace which was agitated moſt violently by the firſt earthquake.

"The plain, which was undoubtedly the moſt ſlender part of the vault, yielded moſt eaſily. The city of Meſſina, placed upon low ground, experienced a ſhock which the buildings on higher grounds did not. The moving force ceaſed at once as ſuddenly as it acted violently. When, at the periods of the 7th of February and the 28th of March, the focus appeared changed, the plain ſcarce ſuffered any thing. The ſubterraneous noiſe, which preceded and accompanied the ſhocks, appeared always to come from the ſouthweſt, in the direction of Meſſina. It ſeemed like thunder under ground, which reſounded beneath vaults.

"If Ætna, then, has been the occaſional cauſe of the earthquakes, it has alſo prepared, for ſome time, the misfortunes of Calabria, by gradually opening a paſſage along the coaſt of Sicily to the foot of the Neptunian mountains: for during the earthquakes of 1780, which diſturbed Meſſina the whole ſummer, they felt, the whole length of that coaſt, from Taormina even to the Faro, conſiderable ſhocks; but near the village of Alli and Fiume de Niſi, which are ſituated about the middle of that line, ſhocks ſo violent were experienced, that they dreaded leſt the mouth of a volcano ſhould open. Each ſhock reſembled the effort of a mine that had not ſtrength to make an exploſion. It appears, that then the volcano opened a free paſſage for the expanſion of its vapours, and that they have ſince circulated without reſtraint; ſince in the year 1783 the earthquake was almoſt nothing upon that part of Sicily, at the time that Meſſina buried under its ruins the half of its inhabitants."

90 Diſagreement with regard to facts betwixt M. Dolomieu and Sir William Hamilton.

On this theory it is firſt to be obſerved, that there is a conſiderable diſagreement in points of *fact* betwixt M. Dolomieu and Sir William Hamilton. The former could find no account of any ſpark or other electrical phenomenon: the latter, on the contrary, was aſſured that flames had often been ſeen to iſſue from the earth; and theſe he expreſsly attributes to a vapour charged with *electrical fire*. M. Dolomieu takes little notice of the rains that fell; while Sir William Hamilton attributes to them ſeveral of thoſe diſruptions of the earth, which, without them, would have ſeemed very extraordinary. The latter likewiſe informs us,

91
Proofs of electricity being concerned.

92
M Dolomieu's hypotheſis inſufficient.

us, that before a ſhock the clouds remained motionleſs; and that, after a heavy ſhower of rain, a ſmart ſhock followed. Theſe were phenomena that ſhowed ſome connection between what paſſed in the earth and in the atmoſphere: but betwixt theſe two there is no agent that we know of excepting electricity, at leaſt there is none of ſufficient ſtrength to produce any violent effects by communication between the one and the other. The moſt enthuſiaſtic imagination cannot ſuppoſe that huge cauldrons of boiling water under Mount Ætna ſhould make the clouds ſtand ſtill over Calabria; and the quick ſucceſſion of the ſhock to an heavy ſhower of rain ſhowed that the cauſe, whatever it was, lay in the ground on which the rain fell, and that it could be put in action by what affected the ſurface of the ground. But the cauſe of earthquakes appears, from the facts related n° 25, to lie at a greater depth in the earth than 396 feet; but no ſhower of rain could affect the earth to this depth unleſs by making ſome alteration in its electricity. Theſe phenomena, which M. Dolomieu has overlooked, evidently ſhow that electricity was concerned in this earthquake as well as others.

93
Of the foreknowledge which brute animals had of the ſhock.

Another circumſtance, which M Dolomieu himſelf mentions, is a ſufficient proof of electricity being concerned; and that is the preſentiment which animals had of its approach. "The preſentiment of animals (ſays he) at the approach of earthquakes, is a ſingular phenomenon, and which cannot fail to ſurpriſe us ſo much the more, as we know not by what organs it is communicated to them. Every ſpecies of animals experiences it, eſpecially dogs, geeſe, and poultry. The howlings of the dogs in the ſtreets of Meſſina were ſo loud, that orders were iſſued to kill them." Now, we know that many animals have a preſentiment of a change of weather; which may happen either from a change of the denſity of the atmoſphere, or from ſome alteration in its electricity: but ſteam pent up in the bowels of the earth could affect no animal until it began to exert its effects. Sir William Hamilton likewiſe informs us, that geeſe ſeemed more affected by this cauſe when in the water than out of it; which may eaſily be explained upon electrical principles, but not at all, at leaſt not without the moſt extravagant ſuppoſitions, by ſteam pent up in caverns nobody knows where.

94
Erroneous method of arguing purſued by M Dolomieu.

Again, it is evident that Mr Dolomieu's hypotheſis is ſupported in the worſt manner imaginable, viz. by arguing from things unkown to what we ſee; but the true method of argument always is from what we ſee to things unknown. By this unhappy error he has made choice of cauſes which cannot poſſibly anſwer the purpoſe. Let any quantity of water we pleaſe be poured into the focus of mount Ætna; nay, let the ſea itſelf break into it: the conſequence could only have been what happened in 1755, viz. not an earthquake in Calabria, but a vaſt effuſion of boiling water from the top of the mountain itſelf. Nature here made the experiment; and we have no reaſon to imagine that any other conſequence would have followed, though it had been repeated ever ſo often. Our author ſeems alſo to have forgot, that aqueous ſteam is capable of condenſation, and that when it is admitted into a cold place it inſtantly loſes its expanſive power. Let us ſuppoſe caverns upon caverns extended in any way he pleaſes: the greater their bulk, the more will he be embarraſſed; for thus th eſteam would have room to circulate; and far from producing thoſe dreadful convulſions, muſt have returned quietly into water, without being able to ſtir the earth in the leaſt. It would appear indeed, that the power of aqueous ſteam is very much over-rated both by M. Dolomieu and other writers. An anonymous author in the *Journal de Phyſique* for Auguſt 1785, has drawn a compariſon between volcanoes and ſteam-engines; and expreſſes his ſurpriſe that nobody has taken notice of it ſooner. "A ſteam-engine (ſays he), conſiſts of a caldron or boiler, covered with a lid, having an opening in the middle, to which is fitted an hollow cylinder, &c. The boiler is ſet over a fire, and from the water in it riſes a vapour, the expanſive force of which raiſes the piſton of the machine. The action of the vapour is afterwards inſtantaneouſly annihilated by a jet of cold water into the cylinder through a hole, when the weight of the atmoſphere takes place, forces down the piſton, and conſequently raiſes the water in the pump.

95
The earthquakes could not be occaſioned by water poured into Mount Ætna.

96
Compariſon between volcanoes and ſteam-engines.

"It is known that vapour occupies a ſpace 15,000 or 16,000 times greater than the bulk of the water which produced it; hence it follows, that the ſmaller the ſpace is in which it is contained, the force of its expanſion will be the greater. It has ſometimes happened, that vapour, in a ſteam-engine, not having ſufficient play, has burſt the veſſels in which it was contained, deſtroyed the building, and thrown the ſtones and boiling water to a great diſtance. It is now furniſhed with holes, by which the quantity of water can be aſcertained, and with a valve which gives way when the vapour is ſuperabundant. When the vapour iſſues by this valve, it ſtrikes the air with ſuch force as to occaſion a very loud hiſſing noiſe. The force of vapour ſufficient for raiſing a piſton of a given diameter is equal to the weight of a column of water 22 feet in height, and of a baſe equal to the piſton; ſo that, ſuppoſe a cubic foot of water to weigh 70 pounds, and the piſton to be a foot ſquare, the force of the vapour ſufficient for raiſing it will be 1540 pounds; an agent ſo powerful, that hardly any thing elſe in nature can be compared with it.

97
Vulcanoes, earthquakes, &c all ſuppoſed to be owing to ſteam.

"Now if we recollect the deſcriptions of volcanoes, their eruptions, the earthquakes and hiſſing noiſes which ſometimes precede or accompany them; the ſtones of different ſorts, boiling water, ſulphur, and bitumens which they diſcharge; if we hear of rocks thrown to the diſtance of ſeven or eight miles from the mouth of the volcano; clouds of aſhes, and torrents of lava, ſeas overflowing, rivers left dry, &c. &c. we will find all theſe the effects of great natural ſteam-engines: that is to ſay, they are produced by maſſes of combuſtible matter ſet on fire by fermentation, placed in the neighbourhood of caverns filled with the waters of the ſea, of rivers or lakes. We cannot doubt that the interior parts of the earth are hollowed out into numberleſs caverns that extend in different directions, and to various depths; and that mountains and other inequalities, and the buildings raiſed by men, are merely the lid or covering, more or leſs thick, of theſe caverns, which vary in ſhape, and in the materials of which they are compoſed. Places therefore covered with buildings and mountains, are more liable

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ble to earthquakes, becauſe they are leſs able to give way to the ſhock: and the farther places are diſtant from volcanoes, the leſs they have to fear from earthquakes; becauſe the vapour having room to expand itſelf by the ramifications of the ſubterraneous paſſages, the ſhocks will be leſs violent and leſs frequent. It is this which, in all probability, has hitherto ſaved Naples.

“ Now, let it not be ſaid, that we have miſtaken the cauſe of earthquakes: for if, on the one hand, we attentively conſider the ſteam-engine and its effects, and on the other, obſerve volcanoes always in the neighbourhood of water, we will be convinced, that they differ in nothing from that machine, but becauſe this is under the command and direction of art. The diſappearance and formation of iſlands and mountains may be explained from the ſinking in of caverns, or from their being lifted up by the force of vapour.—Laſtly, thoſe vapours which, in the year 1783, covered at the ſame time, and almoſt during four months, a part of Europe, Aſia, and Africa, were probably vapour eſcaped from thoſe great internal caverns, heated by a ſufficient quantity of combuſtible matters, ſet on fire by fermentation in the great chemical laboratories in the bowels of the earth. In certain diſtricts of Burgundy, theſe vapours were found to be hot, for they dried up and deſtroyed the grapes.”

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That the power of ſteam-engines is very great, there is no doubt; but all that we ſee them uſually perform, is little more than merely overcoming the preſſure of the atmoſphere on the piſton of the cylinder. Now this preſſure is equally ſtrong over the whole ſurface of the earth; ſo that before the ground could be ſhaken in the ſmalleſt degree, the whole preſſure of the atmoſphere incumbent upon it muſt be removed. But if we begin to make any calculations with regard even to this force, which muſt be removed as a preliminary, we ſhall find it to be inconceivably great. A ſquare mile contains 27,878,400 ſquare feet; and upon each of theſe the preſſure is 2160 pounds. The atmoſpherical preſſure on a ſquare mile is the product of theſe two numbers, or 60,217,344,000 pounds; but the great earthquake of 1755 ſhook no leſs than 4,000,000 of ſquare miles of the earth; and therefore muſt in the firſt place have overcome a preſſure of more than 240,000 millions of millions of pounds: and after all this, it had ſtill a much greater obſtacle, viz. the immenſe weight and coheſion of the earth itſelf. Dr Stukely* has calculated, that no conceivable quantity of gunpowder could have moved the earth ſhaken by the earthquake in Aſia Minor, which affected a circle of 300 miles diameter: but the earthquake of 1755 muſt have required not only a much greater power to move the earth, as affecting a ſurface much greater than that of a circle 300 miles in diameter, but alſo the atmoſpherical preſſure above mentioned, which does not enter into the Doctor's calculation. There cannot therefore be any conceivable quantity of water, of fire, or of ſteam in the bowels of the earth, ſufficient to produce ſuch effects; nor is there any power in nature to which we can with the ſmalleſt probability attribute them, electricity alone excepted. Calculations have indeed been made, that the force of ſteam is 28 times greater than that of gunpowder: but this ſeems only to be in one particular caſe, viz. when water is thrown upon melted copper; which cannot poſſibly take place in the bowels of the earth. In other caſes water explodes with much leſs violence; and, when thrown upon melted glaſs, does not explode at all. The very violent effects of water when thrown upon copper in fuſion, therefore, moſt probably are to be attributed to a decompoſition of the water, one part of it being united to the calx of the metal, and the other ſuddenly converted into an aerial vapour; the inſtantaneous production and rarefaction of which ſeems in moſt caſes to be the cauſe of exploſion *. The ſimple preſſure of ſteam, and the burſting of a veſſel by it when long continued, cannot at all be introduced as a parallel caſe, nor are the effects in any degree ſimilar; becauſe we cannot imagine ſolid metallic veſſels in the bowels of the earth to confine the ſteam till it acquired ſuch ſtrength. At all events the ſteam muſt have penetrated the looſe earth, which it could not fail to meet with in many places, looſened it, and condenſed itſelf; and if any perſon will cover a ſteam engine with ſtones and rubbiſh inſtead of a cloſe lid, he will certainly find this to be the caſe.

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101
Exploſion of water with copper probably occaſioned by a decompoſition.

102
Of the uſes of earthquakes.

The only power with which we are acquainted, and which is capable of producing earthquakes, then, being that of the electrical fluid, it only remains to conſider what uſes they may be thought to anſwer in the ſyſtem of nature. As they are the effects of the very higheſt natural power, it cannot be ſuppoſed that they are produced merely for the purpoſes of deſtruction; and, on the other hand, as they certainly do a great deal of miſchief, it ſeems as difficult to aſſign any benevolent purpoſe they can anſwer. It is very generally ſuppoſed, indeed, that earthquakes are the means by which Nature raiſes mountains and land from the bottom of the ſea; but this can never be admitted. We have many inſtances of mountains being ſwallowed up and loſt by earthquakes, but not a ſingle well atteſted one of a mountain being raiſed by them; and even when volcanoes are taken into the account, by which ſome mountains and iſlands have certainly been raiſed, the balance appears againſt them, and more land ſeems to have been ſunk by them than ever was raiſed *. It ſeems moſt probable therefore that earthquakes are accidental, and that the miſchief they do is only to prevent a greater evil. This we ſee takes place throughout the whole ſyſtem of nature. Thunder and lightning, violent rains, ſtorms of wind, &c. are all productive of much damage on certain occaſions; but we by no means ſuppoſe theſe phenomena to take place merely for deſtruction; and therefore we name ſuch effects *accidents*. To the ſame account, though on a larger ſcale, muſt we place earthquakes; and it only now remains to conſider what are the diſaſters ſtill more terrible than earthquakes which we ſhould have occaſion to dread, did they not interpoſe to prevent them.

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They cannot be the means of raiſing mountains.

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Are probably accidental circumſtances, by which greater evils are prevented.

Theſe evils are naturally to be dreaded from any general commotion of the electric fluid diſperſed thro' the whole globe of earth. That it does pervade it to the centre, is what we can have no reaſon to doubt; but in the internal parts it ſeems to lie dormant, or to be employed in operations which never manifeſt themſelves to us. Towards the ſurface it is manifeſtly ſet in motion by the light of the ſun; which, as proved under the article ELECTRICITY, and in various other parts of this work, is the very ſame fluid. This produces

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* See *Exploſion*.

* See *Volcano*.

105 A conſtant current of electric matter from the equator to the poles.

106 Dreadful conſequences of an univerſal commotion in the electric fluid.

107 Why this can never take place.

duces a conſtant current through the bowels of the earth from the equator towards the poles; for as the equatorial parts abſorb more of the light than thoſe farther ſouth or north, it muſt naturally be driven out in the northern and ſouthern regions in proportion to the quantity abſorbed at the equator. In what manner earthquakes are then produced by it, has already been explained at length. They are the ſhocks occaſioned by its paſſing in great quantity from one place where it is preſſed and confined, to another from which it has a free paſſage; or from a part of the earth poſitively electrified, to one that is negatively ſo. Let us ſuppoſe, however, that ſuch obſtructions are thrown in its way, that it cannot get out of the earth by any paſſage. The conſequence of this muſt very ſoon be, that the motion of the light acting upon the equatorial parts would be propagated through the whole globe; and this would be productive of conſequences much more terrible than any we can conceive. We ſee that by ſetting it in motion in a ſmall part of the atmoſphere or of the earth, the moſt violent effects enſue; but ſhould this tremendous fluid be obliged to *put forth all its ſtrength*, the earth muſt be ſhaken from the centre. Inſtead of plantations and little hills removed from their places, as in Calabria, it is more than probable that the largeſt iſlands and continents would be detached from their baſes, or perhaps an univerſal diſſolution enſue. Happily, however, ſuch an effect never can take place, becauſe the electric matter always vents itſelf by the ſuperficial parts; for the depths to which even the cauſes of earthquakes and volcanoes deſcend, are undoubtedly ſuperficial in compariſon of the vaſt thickneſs of the body of the earth itſelf. The great bulk of electric fluid therefore lies quietly in the central parts; and is never moved by the commotions of that which lies on the ſurface, any more than the water at the bottom of the ocean is moved by the ſtorms which ruffle the upper part.

108 Progreſs of the electric matter diſcernible after the earthquake in Calabria.

109 Occaſions violent eruptions of fire in Greenland and Iceland.

110 Violent thunder-ſtorms throughout all Europe.

111 Appears in the great meteor of 1783.

In the earthquakes in Calabria, the progreſs of the electric matter northward might be traced both thro' the bowels of the earth and through the atmoſphere. The great ſhocks happened in the month of February, but continued more or leſs through the whole ſummer. It was obſerved that Stromboli ſmoked leſs than uſual, and no particular eruption happened either of Ætna or Veſuvius. This ſhowed that the electric matter was going ſomewhere elſe; nor was it long of diſcovering the courſe it had taken. In the beginning of ſummer a violent volcanic eruption took place in Greenland; its extent and power, however, were not known; but in the beginning of June a volcanic earthquake commenced in Iceland, and continued for eleven days without intermiſſion. This was followed by the moſt extraordinary effuſion of lava recorded in hiſtory, which continued till the 12th of Auguſt. All this time there were violent and numerous thunder ſtorms, firſt in the ſouthern and then in the more northerly parts of Europe; the air was covered with a never-ceaſing haze, not of a moiſt nature, as our author in the *Journal de Phyſique* ſuppoſes, and which he abſurdly ſays *dried* the grapes in Burgundy, but plainly of ſome other kind, and which prevented the light of the ſun from having its uſual effect. Six days after the immenſe volcanic eruption in Iceland had ceaſed, the great meteor made its appearance, which no doubt was the very ſame quantity of electric matter that had raiſed ſuch horrid commotions in the earth and atmoſphere, returning thro' the higher ſpaces to the ſouth from whence it had originally proceeded.

112 Why ea quakes not hap in the of thuo ſtorms.

Before we diſmiſs this article, it may ſtill be neceſſary to obviate an objection which may be raiſed from what is ſaid under the article LIGHTNING. It is there ſhown, that in the time of a thunder ſtorm, the parts of the earth which lie directly under the cloud are divided for ſome ſpace downward into alternate zones poſitively and negatively electrified; that the lightning from the cloud ſtrikes not the uppermoſt ſtratum directly, but only as it is impoſſible to avoid it, becauſe it lies betwixt the cloud and the zone by which the electric matter is attracted. It may then be aſked, Why an earthquake is not produced by the diſcharge of theſe two oppoſite electricities into one another directly, without the production of any thunder? Here, however, we muſt obſerve, that the electricity is originally accumulated in the atmoſphere, where the vapours ſerve as conductors, and the ſurrounding air and upper ſurface of the earth being electrified the ſame way, prevent the electric matter from ſilently diſcharging itſelf, by inſulating the clouds in the ſame manner that the conductor of a machine is inſulated by the electric ſubſtance on which it ſtands. The flaſh of lightning muſt therefore burſt out from theſe conductors in the very ſame manner that a ſpark proceeds from the prime conductor of an electrical machine, rather than from the globe or atmoſphere next to it, though both of them are undoubtedly very highly electrified at the time the machine is ſet in motion. At the ſame time it muſt be conſidered, that this continual flaſhing of the atmoſpherical electricity towards the earth, prevents any very high degree of it from accumulating in either of the terreſtrial zones already mentioned, ſo as to produce any diſcharge between them, which would indeed produce a ſhock of an earthquake.

113 Of elec cal exp ſions pr ceeding from th earth.

114 A fatal [illegible] coun ſor.

From an unhappy accident which happened in 1785, related by Mr Brydone in the Phil. Tranſ. for that year, we learn, that though in a thunder ſtorm the atmoſpherical electricity and that of the earth are the ſame, yet at ſome diſtance there is a difference betwixt them, and diſcharges are made from the one to the other. The accident alluded to was the deſtruction of a man and two horſes by an electrical exploſion from the earth in the time of a thunder ſtorm. At the place where the exploſion happened, there was an interval of 25 or 30 ſeconds betwixt the flaſh and the clap of thunder, ſo that it muſt have been at the diſtance of between five and ſix miles; the great exploſion ſuddenly burſt out from the ſpot over which the cart-wheels paſſed to which the horſes were yoked, partially melted the iron of the wheels, killed the man who ſat on the fore-part of the cart, and tore his clothes almoſt to pieces. Two circular holes of about 20 inches diameter were made in the ground, and the earth and ſtones ſcattered about; but no fire was perceived. About an hour before the exploſion, ſome fiſhermen were caught in a violent whirlwind, which felt hot and ſultry. A lamb was killed by another exploſion about a quarter of an hour before the great one, and a woman received a violent ſtroke on the foot without being able to tell whence it proceeded. At the time the lamb was killed, the ſhepherd

ſhepherd ſaid he felt a ſenſation as if fire had paſſed over his face.

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By theſe exploſions, particularly the great one, the equilibrium of electricity in the atmoſphere was inſtantly reſtored, and the clouds forthwith began to ſeparate. The reaſon of this is explained under the article Lightning; here it is ſufficient to obſerve, that where there is a difference between the electricity of the atmoſphere and that of the earth, an earthquake cannot happen. Thoſe electrical exploſions experimentally demonſtrate the truth of what is argued from the principles of electricity, n° 82, *viz.* that juſt before an earthquake there is a perfect equilibrium between the electricity of the atmoſphere and that of the ſurface of the earth. When this equilibrium is broken, the earth diſcharges its ſuperfluous quantity either ſilently, by means of trees, graſs, &c. or ſometimes by exploſions in different places; but as there is no general conductor, there cannot be any general diſcharge of the whole at once. The ſingular caſe of the great diſcharge in 1785 was owing only to the accidental preſence of a good conductor, *viz.* the iron of the cart-wheels paſſing over the ſpot where the electric matter happened to be collected in great quantity. Had not this taken place, it is poſſible that a fire-ball might have riſen from the earth; for the exploſion produced effects extremely ſimilar to thoſe of the burſting of fire-balls*: but ſtill this could have no effect in producing any ſhock of an earthquake; becauſe the latter would have required a general diſcharge betwixt two great ſtrata of earth, where there cannot be any conductor to make partial ones.

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In the time of earthquakes, however, there are undoubtedly many ſuch electrical diſcharges from the earth as thoſe juſt mentioned; and they are moſt probably the cauſe of thoſe conical hollows obſerved by Sir William Hamilton. When water is abundant in any part of the earth, it ſerves as a conductor for ſome quantity of the electricity, and that fluid is violently thrown out into the air: but where there is a deficiency of water, the fire breaks forth in its proper form with loud exploſions, as was obſerved; as well as the water ſpouts in Calabria in the year 1783. That year alſo the quantity of electric matter diſcharged by the earth into the air was manifeſt by the vaſt number of thunder ſtorms which immediately followed them. No fire was obſerved at the time of the exploſion which put an end to the thunder-ſtorm above mentioned; but this muſt have ariſen partly from its happening in the day-time, and partly from the electric matter having ſo many conductors to ſpend its force upon.

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Having thus explained all the phenomena attending earthquakes, it remains only to ſhow by what means the equilibrium of electricity can be broken in the bowels of the earth in ſuch a manner as to produce theſe phenomena. The ultimate cauſe of this is mentioned under the article Aurora Borealis, n° 5. It is there ſhown, that the warmth of the ſun muſt neceſſarily bring down to the earth much greater quantities of electric matter in the regions within the tropics than in the northern and ſouthern climates. It is impoſſible, as is there alſo obſerved, that there can be a perpetual accumulation of electricity in one part of the earth, unleſs there is a paſſage for it into the atmoſphere through ſome other. Hence, if the electric matter deſcends from the air into one place of the earth, it muſt neceſſarily aſcend from the earth into the air in ſome other place. There muſt be therefore a continual current of electricity through the bowels of the earth, beginning at the equator, and extending northward and ſouthward to both poles. While this current has a free paſſage from the earth in the northern and ſouthern regions, every thing goes on quietly; and whatever ſtorms may happen in the atmoſphere, the ſolid earth cannot be affected. Innumerable circumſtances, however, may tend to hinder this diſcharge, and conſequently to accumulate the electric matter in particular places. One very obvious cauſe of this kind, is an exceſſive froſt taking place in any part of the earth whence the electric matter was wont to be diſcharged. This renders the air itſelf ſo electric, that it cannot receive the fluid; at the ſame time that the water on the ſurface of the earth, being hard frozen, becomes electric alſo, and incapable of conducting. Very dry ſeaſons likewiſe contribute to produce the ſame effect; and thus the accumulation of electricity in the warmer climates becomes prodigiouſly great. Hence perhaps we have ſome reaſon to conclude, that the exceſſive cold which prevailed over all Europe in 1782 was a principal cauſe of the earthquakes in 1783.

It muſt, however, be obſerved, that with regard to the operations of nature we cannot always reaſon analogically from our electric experiments. If a quantity of electricity is collected in any ſubſtance by artificial means, that quantity is taken off in a moment by the touch of any metallic ſubſtance or other good conductor. As the whole earth, therefore, is filled with a conducting ſubſtance, namely water, it may very naturally be aſked, Why does not the ſuperfluous quantity of electric matter collected in one place, immediately diſperſe itſelf through all other parts of the earth by means of the water with which it abounds?—To obviate this difficulty, however, it needs only be remembered, that as the earth is quite full of electric matter all round, no quantity can enter any particular part without being reſiſted by the reſt which is diffuſed through the whole globe. This reſiſtance will be proportioned to the facility with which it can eſcape at other places; and this it never can do, unleſs the earth is in a proper condition for emitting, and the atmoſphere for receiving, it The preſſure, therefore, upon the accumulated quantity of electric matter ſoon becomes exceedingly great, and its diſpoſition to burſt out with violence is every day increaſed. At laſt, as the ſun ſtill continues to occaſion the deſcent of more and more of the electric fluid, that particular part of the earth becomes fully charged. The conſequence of this is, that the waters of fountains become foul; the electric matter being lodged in great quantity in the water, forces it into unuſual agitations, by which the earth is mixed with it. The ocean, for the ſame reaſon, is raiſed in huge billows, &c.; and theſe appearances prognoſticate the ſhock, in the ſame manner that ſlight flaſhes from the knob of an electrified bottle prognoſticate a diſcharge of all the electricity contained in it.

Beſides the earthquakes above deſcribed, of which the cauſe ſeems to depend entirely on a collection of electric matter in the bowels of the earth, there are others frequently felt in the neighbourhood of volcanoes, which

which are plainly owing to the efforts of the burning matter to diſcharge itſelf. Theſe, however, are but ſlight, and ſeldom extend to any conſiderable diſtance from the burning mountain. For a particular account of them, ſee the article Volcano.

EASEL pieces, among painters, ſuch ſmaller pieces, either portraits or landſcapes, as are painted on the eaſel, *i. e.* the frame whereon the canvas is laid.—They are thus called, to diſtinguiſh them from larger pictures drawn on walls, cielings, &c.

EASEMENT, in law, a privilege or convenience which one neighbour has of another, whether by charter or preſcription, without profit: ſuch are a way through his lands, a ſink, or the like. Theſe, in many caſes, may be claimed.

EASING, in the ſea-language, ſignifies the ſlackening a rope or the like. Thus, to eaſe the bow-line or ſheet, is to let them go ſlacker; to eaſe the helm, is to let the ſhip go more large, more before the wind, or more larboard.

EAST, one of the four cardinal points of the world; being that point of the horizon where the ſun is ſeen to riſe when in the equinoctial.

The word *eaſt* is Saxon. In Italy, and throughout the Mediterranean, the eaſt wind is called the *levante:* in Greek, ανατολη and απηλιωτης, becauſe it comes from the ſide of the ſun, ατ' ηλιν; in Latin, *eurus*.

EASTER, a feſtival of the Chriſtian church, obſerved in memory of our Saviour's reſurrection.

The Greeks call it *paſga*, the Latins *paſcha*, an Hebrew word ſignifying *paſſage*, applied to the Jewiſh feaſt of the paſſover. It is called *eaſter* in Engliſh, from the goddeſs Eoſtre, worſhipped by the Saxons with peculiar ceremonies in the month of April.

The Aſiatic churches kept their eaſter upon the very ſame day the Jews obſerved their paſſover, and others on the firſt Sunday after the firſt full moon in the new year. This controverſy was determined in the council of Nice; when it was ordained that eaſter ſhould be kept upon one and the ſame day, which ſhould always be a Sunday, in all Chriſtian churches in the world. For the method of finding eaſter by calculation, ſee Chronology, nº 31.

*Easter Iſland*, an iſland in the South Sea, lying in N. Lat. 27. 5. W. Long. 109. 46. It is thought to have been firſt diſcovered in 1686 by one Davis an Engliſhman, who called it *Davis's Land*. It was next viſited by Commodore Roggewein, a Dutchman, in 1722; who gave it the name of *Eaſter Iſland*, and publiſhed many fabulous accounts concerning the country and its inhabitants. It was alſo viſited by a Spaniſh ſhip in 1770, the captain of which gave it the name of *St Carlos*. The only authentic accounts of this iſland, however, which have yet appeared, are thoſe publiſhed by Captain Cook and Mr Forſter, who viſited it in the month of March 1774.—According to theſe accounts, the iſland is about 10 or 12 leagues in circumference, and of a triangular figure; its greateſt length from north-weſt to ſouth-eaſt is about four leagues, and its greateſt breadth two. The hills are ſo high, that they may be ſeen at the diſtance of 15 or 16 leagues. The north and eaſt points of the iſland are of a conſiderable height; between them, on the ſouth-eaſt ſide, the ſhore forms an open bay, in which Captain Cook thinks the Dutch anchored in 1722. He himſelf anchored on the weſt ſide of the iſland, three miles northward from the ſouth point. This, he ſays, is a good road with eaſterly winds; but a dangerous one when the wind blows from the contrary quarter, as the other on the ſouth-eaſt ſide muſt be with eaſterly winds: ſo that there is no good accommodation to be had for ſhipping round the whole iſland.

The iſland itſelf is extremely barren; and bears evident marks not only of a volcanic origin, but of having been not very long ago entirely ruined by an eruption. As they approached the ſouth point, Mr Forſter informs us, that they obſerved the ſhore to riſe perpendicularly. It conſiſted of broken rocks, whoſe cavernous appearance, and black or ferruginous colour, ſeemed to indicate that they had been thrown up by ſubterraneous fire. Two detached rocks lie about a quarter of a mile off this point: one of them is ſingular on account of its ſhape, and repreſents a huge column or obeliſk; and both theſe rocks were inhabited by multitudes of ſea-fowls. On landing and walking into the country, they found the ground covered with rocks and ſtones of all ſizes, which appeared to have been expoſed to a great fire, where they ſeemed to have acquired a black colour and porous texture. Two or three ſhrivelled ſpecies of graſſes grew among theſe ſtones, and in ſome meaſure ſoftened the deſolate appearance of the country. The farther they advanced, the more ruinous the face of the country ſeemed to be. The roads were intolerably rugged, and filled with heaps of volcanic ſtones, among which the Europeans could not make their way but with the greateſt difficulty; but the natives leaped from one ſtone to another with ſurpriſing agility and eaſe. As they went northward along the iſland, they found the ground ſtill of the ſame nature; till at laſt they met with a large rock of black melted lava, which ſeemed to contain ſome iron, and on which was neither ſoil nor graſs, nor any mark of vegetation. Notwithſtanding this general barrenneſs, however, there are ſeveral large tracts covered with cultivated ſoil, which produces potatoes of a gold yellow colour, as ſweet as carrots, plantains, and ſugar-canes. The ſoil is a dry hard clay; and the inhabitants uſe the graſs which grows between the ſtones in other parts of the iſland as a manure, and for preſerving their vegetables when young from the heat of the ſun.

The moſt remarkable curioſity belonging to this iſland is a number of Coloſſian ſtatues; of which, however, very few remain entire. Theſe ſtatues are placed only on the ſea-coaſt. On the eaſt ſide of the iſland were ſeen the ruins of three platforms of ſtone-work, on each of which had ſtood four of theſe large ſtatues; but they were all fallen down from two of them, and one from the third: they were broken or defaced by the fall. Mr Wales meaſured one that had fallen, which was 15 feet in length, and ſix broad over the ſhoulders: each ſtatue had on its head a large cylindric ſtone of a red colour, wrought perfectly round. Others were found that meaſured near 27 feet, and upwards of eight feet over the ſhoulders; and a ſtill larger one was ſeen ſtanding, the ſhade of which was ſufficient to ſhelter all the party, conſiſting of near 30 perſons, from the rays of the ſun. The workmanſhip is rude, but not bad, nor are the features of the face ill formed; the ears are long, according to the diſtortion

tion practiſed in the country, and the bodies have hardly any thing of a human figure about them. How theſe iſlanders, wholly unacquainted with any mechanical power, could raiſe ſuch ſtupendous figures, and afterwards place the large cylindric ſtones upon their heads, is truly wonderful! The moſt probable conjecture ſeems to be, that the ſtone is factitious; and that each figure was gradually erected, by forming a temporary platform round it, and raiſing it as the work advanced: but they are at any rate very ſtrong proofs of the ingenuity and perſeverance of the iſlanders in the age when they were built, as well as that the anceſtors of the preſent race had ſeen better days than their deſcendants enjoy. The water of this iſland is in general brackiſh, there being only one well that is perfectly freſh, which is at the eaſt end of the iſland: and whenever the natives repair to it to ſlake their thirſt, they waſh themſelves all over; and if there is a large company, the firſt leaps into the middle of the hole, drinks, and waſhes himſelf without ceremony; after which another takes his place, and ſo on in ſucceſſion. This cuſtom was much diſreliſhed by their new friends, who ſtood greatly in need of this valuable article, and did not wiſh to have it contaminated by ſuch ablutions.

The people are of a middle ſize. In general they are rather thin; go entirely naked; and have punctures on their bodies, a cuſtom common to all the inhabitants of the South Sea iſlands. Their greateſt ſingularity is the ſize of their ears, the lobe of which is ſtretched out ſo that it almoſt reſts on their ſhoulder; and is pierced with a very large hole, capable of admitting four or five fingers with eaſe. The chief ornaments for their ears are the white down of feathers and rings which they wear in the inſide of the hole, made of the leaf of the ſugar-cane, which is very elaſtic, and for this purpoſe is rolled up like a watch-ſpring. Some were ſeen clothed in the ſame cloth uſed in the iſland of Otaheite, tinged of a bright orange-colour with turmeric; and theſe our voyagers ſuppoſed to be chiefs. Their colour is a cheſnut-brown; their hair black, curling, and remarkably ſtrong; and that on the head as well as the face is cut ſhort. The women are ſmall, and ſlender-limbed: they have punctures on the face, reſembling the patches ſometimes uſed by European ladies; they paint their face all over with a reddiſh brown ruddle, and above this they lay a fine orange-colour extracted from turmeric-root; the whole is then variegated with ſtreaks of white ſhell-lime. But the moſt ſurpriſing circumſtance of all with regard to theſe people, is the apparent ſcarcity of women among them. The niceſt calculation that could be made, never brought the number of inhabitants in this iſland to above 700, and of theſe the females bore no proportion in number to the males. Either they have but few females, or elſe their women were reſtrained from appearing during the ſtay of the ſhip; notwithſtanding, the men ſhowed no ſigns of a jealous diſpoſition, or the women any ſcruples of appearing in public: in fact, they ſeemed to be neither reſerved nor chaſte; and the large pointed cap which they wore gave them the appearance of profeſſed wantons. But as all the women who were ſeen were liberal of their favours, it is more than probable that all the married and modeſt ones had concealed themſelves from their impetuous viſitants in ſome inſcrutable parts of the iſland; and what further ſtrengthens this ſuppoſition is, that heaps of ſtones were ſeen piled up into little hillocks, which had one ſteep perpendicular ſide, where a hole went under ground. The ſpace within, ſays Mr Forſter, could be but ſmall; and yet it is probable that theſe cavities ſerved, together with their miſerable huts, to give ſhelter to the people at night; and they may communicate with natural caverns, which are very common in the lava currents of volcanic countries. The few women that appeared were the moſt laſcivious of their ſex that perhaps have been ever noticed in any country, and ſhame ſeemed to be entirely unknown to them.

EATON, a town of Buckinghamſhire, ſituated on the north ſide of the Thames, oppoſite to Windſor, and famous for its collegiate ſchool, founded by King Henry VI. being a ſeminary for King's College, Cambridge, the fellows of which are all from this ſchool.

EAU de Carmes. See Pharmacy.

*Eau de Luce.* See Chemistry, n° 1037.

EAVES, in architecture, the margin or edge of the roof of an houſe; being the loweſt tiles, ſlates, or the like, that hang over the walls, to throw off water to a diſtance from the wall.

*Eaves-Droppers*, are ſuch perſons as ſtand under the eaves, or walls, and windows of a houſe, by night or day, to hearken after news, and carry it to others, and thereby cauſe ſtrife and contention in the neighbourhood. They are called *evil members of the commonwealth* by the ſtat. of Weſt. 1. c. 33. They may be puniſhed either in the court-leet by way of preſentment and fine, or in the quarter-ſeſſions by indictment and binding to good behaviour.

EBBING of the Tides. See Tide.

EBDOMARIUS, in eccleſiaſtical writers, an officer formerly appointed weekly to ſuperintend the performance of divine ſervice in cathedrals, and preſcribe the duties of each perſon attending in the choir, as to reading ſinging, praying, &c. To this purpoſe the ebdomary, at the beginning of his week, drew up in form a bill or writing of the reſpective perſons, and their ſeveral offices, called *tabula*, and the perſons there entered were ſtyled *intabulati*.

EBDOME, Ἑβδόμη, in antiquity, a feſtival kept on the ſeventh of every lunar month, in honour of Apollo, to whom all ſeventh days were ſacred, becauſe one of them was his birth-day; whence he was ſometimes called *Ebdomagenes*. For the ceremonies of this ſolemnity ſee *Potter's Archæol. Græc.* lib. ii. cap. 20.

EBENUS, the ebony tree: A genus of the decandria order, belonging to the diadelphia claſs of plants: and in the natural method ranking under the 32d order, *Papilionaceæ*. The ſegments of the calyx are the length of the corolla, and the latter has ſcarce any alæ: there is one rough ſeed. There is but one ſpecies, the cretica, a native of the iſland of Crete, and ſome others in the Archipelago. It riſes with a ſhrubby ſtalk three or four feet high; which puts out ſeveral ſide-branches garniſhed with hoary leaves at each joint, compoſed of five narrow ſpear-ſhaped lobes, which join at their tails to the footſtalk, and ſpread out like the fingers of a hand. The branches are terminated by thick ſpikes of large purple flowers, which are of the butterfly or pea-bloom kind. The plants may be propagated from ſeeds ſown in the autumn. In this country the plants muſt be protected during the winter, as they are unable to bear the cold.

EBION, the author of the hereſy of the EBIONITES, was a diſciple of Cerinthus, and his ſucceſſor. He improved upon the errors of his maſter, and added to them new opinions of his own. He began his preaching in Judea: he taught in Aſia, and even at Rome. His tenets infected the iſle of Cyprus. St John oppoſed both Cerinthus and Ebion in Aſia; and it is thought, that this apoſtle wrote his goſpel, in the year 97, particularly againſt this hereſy.

EBIONITES, ancient heretics, who roſe in the church in the very firſt age thereof, and formed themſelves into a ſect in the ſecond century, denying the divinity of Jeſus Chriſt.

Origen takes them to have been ſo called from the Hebrew word *ebion*, which in that language ſignifies *poor*; becauſe, ſays he, they were poor in ſenſe, and wanted underſtanding. Euſebius, with a view to the ſame etymology, is of opinion they were thus called, as having poor thoughts of Jeſus Chriſt, taking him for no more than a mere man.

It is more probable the Jews gave this appellation to the Chriſtians in general out of contempt; becauſe in the firſt times there were few but poor people that embraced the Chriſtian religion. This opinion Origen himſelf ſeems to give into, in his book againſt Celſus, where he ſays, that they called *Ebionites*, ſuch among the Jews as believed that Jeſus was truly the expected Meſſiah.

It might even be urged, with ſome probability, that the primitive Chriſtians aſſumed the name themſelves, in conformity to their profeſſion. It is certain, Epiphanius obſerves, they valued themſelves on being poor, in imitation of the apoſtles. The ſame Epiphanius, however, is of opinion, that there had been a man of the name EBION, the chief and founder of the ſect of Ebionites, contemporary with the Nazarenes and Cerinthians. He gives a long and exact account of the origin of the Ebionites, making them to have riſen after the deſtruction of Jeruſalem, when the firſt Chriſtians, called *Nazarenes*, went out of the ſame to live at Pella.

The Ebionites are little elſe than a branch of Nazarenes; only that they altered and corrupted, in many things, the purity of the faith held among thoſe firſt adherents to Chriſtianity For this reaſon, Origen diſtinguiſhes two kinds of Ebionites, in his anſwer to Celſus: the one believed that Jeſus Chriſt was born of a virgin; and the other, that he was born after the manner of other men.

The firſt were orthodox in every thing, except that to the Chriſtian doctrine they joined the ceremonies of the Jewiſh law, with the Jews, Samaritans, and Nazarenes; together with the traditions of the Phariſees. They differed from the Nazarenes, however, in ſeveral things, chiefly as to what regards the authority of the ſacred writings; for the Nazarenes received all for ſcripture contained in the Jewiſh canon; whereas the Ebionites rejected all the prophets, and held the very names of David, Solomon, Iſaiah, Jeremiah, and Ezekiel, in abhorrence. They alſo rejected all St Paul's epiſtles, whom they treated with the utmoſt diſreſpect.

They received nothing of the Old Teſtament but the Pentateuch; which ſhould intimate them to have deſcended rather from the Samaritans than from the Jews. They agreed with the Nazarenes in uſing the Hebrew goſpels of St Matthew, otherwiſe called the Goſpel of the Twelve Apoſtles; but they had corrupted their copy in abundance of places; and particularly, had left out the genealogy of our Saviour, which was preſerved entire in that of the Nazarenes, and even in thoſe uſed by the Corinthians.

Some, however, have made this goſpel canonical, and of greater value than our preſent Greek goſpel of St Matthew: See NAZARENES. Theſe laſt, whoſe ſentiments, as to the birth of our Saviour, were the ſame with thoſe of the Ebionites, built their error on this very genealogy.

Beſide the Hebrew goſpel of St Matthew, the Ebionites had adopted ſeveral other books, under the names of St James, John, and the other apoſtles: they alſo made uſe of the Travels of St Peter, which are ſuppoſed to have been written by St Clement; but had altered them ſo, that there was ſcarce any thing of truth left in them. They even made that ſaint tell a number of falſehoods, the better to authoriſe their own practices. See St Epiphanius, who is very diffuſive on the ancient hereſy of the Ebionites, *Hær.* 30. But his account deſerves little credit, as, by his own confeſſion, he has confounded the other ſects with the Ebionites, and has charged them with errors to which the firſt adherents of this ſect were utter ſtrangers.

EBONY OF CRETE. See EBENUS.

*EBONY Wood* is brought from the Indies, exceedingly hard and heavy, ſuſceptible of a very fine poliſh, and on that account uſed in moſaic and inlaid works, toys, &c. There are divers kinds of ebony: the moſt uſual among us are black, red, and green, all of them the product of the iſland of Madagaſcar, where the natives call them indifferently *bazon mainthi*, q. d. *black wood*. The iſland of St Maurice, belonging to the Dutch, likewiſe furniſhes part of the ebonies uſed in Europe.

Authors and travellers give very different accounts of the tree that yields the black ebony. By ſome of their deſcriptions, it ſhould be a ſort of palm-tree; by others, a cytiſus, &c. The moſt authentic of them is that of M. Flacourt, who reſided many years in Madagaſcar as governor thereof; he aſſures us, that it grows very high and big, its bark being black, and its leaves reſembling thoſe of our myrtle, of a deep, duſky, green colour.

Tavernier aſſures us, that the iſlanders always take care to bury their trees, when cut down, to make them the blacker, and to prevent their ſplitting when wrought. F. Plumier mentions another black ebony-tree, diſcovered by him at St Domingo, which he calls *ſpartium portulacæ foliis aculeatum ebeni materiæ*. Candia alſo bears a little ſhrub, known to the botaniſts under the name of *EBENUS Cretica*, above deſcribed.

Pliny and Dioſcorides ſay the beſt ebony comes from Ethiopia, and the worſt from India; but Theophraſtus prefers that of India. Black ebony is much preferred to that of other colours. The beſt is a jet black, free of veins and rind, very maſſive, aſtringent, and of an acrid pungent taſte. Its rind, infuſed in water, is ſaid to purge pituita, and cure venereal diſorders; whence Matthiolus took guaiacum for a ſort of ebony. It yields an agreeable perfume when laid on burning coals: when green, it readily takes fire from the abundance of its fat. If rubbed againſt a ſtone, it becomes brown. The Indians make ſtatues of their gods, and

and ſceptres for their princes, of this wood. It was firſt brought to Rome by Pompey, after he ſubdued Mithridates. It is now much leſs uſed among us than anciently; ſince the diſcovery of ſo many ways of giving other hard woods a black colour.

As to the green ebony, beſides Madagaſcar and St Maurice, it likewiſe grows in the Antilles, and eſpecially in the iſle of Tobago. The tree that yields it is very buſhy; its leaves are ſmooth, and of a fine green colour. Beneath its bark is a white blea, about two inches thick; all beneath which, to the very heart, is a deep green, approaching towards a black, tho' ſometimes ſtreaked with yellow veins. Its uſe is not confined to moſaic work: it is likewiſe good in dyeing, as yielding a fine green tincture. As to red ebony, called alſo *grenadilla*, we know little of it more than the name.

The cabinet-makers, inlayers, &c. make pear-tree and other woods paſs for ebony, by giving them the black colour thereof. This ſome do by a few waſhes of a hot decoction of galls; and when dry, adding writing ink thereon, and poliſhing it with a ſtiff bruſh, and a little hot wax; and others heat or burn their wood black. See Dyeing.

EBORACUM (anc. geog.), a famous city of the Brigantes in Britain, the reſidence of Septimius Severus and Conſtantius Chlorus, and where they both died; a Roman colony; and the ſtation of the Legio Sexta Victrix. Now *York*. W. Long. 50. Lat. 54. *Caer-frock*, or *Caer-effroc*, in Britiſh (Camden).

EBRO, anciently Iberus, a large river of Spain, which, taking its riſe in Old Caſtile, runs thro' Biſcay and Arragon, paſſes by Saragoſa, and, continuing its courſe thro' Catalonia, diſcharges itſelf with great rapidity into the Mediterranean, about 20 miles below the city of Tortoſa.

EBUDÆ, or Hebudes (anc. geog.), iſlands on the weſt of Scotland. The ancients differ greatly as to their ſituation, number, and names; ſaid in general to lie to the north of Ireland and weſt of Scotland. Now called the *Weſtern Iſles*, alſo *Hebrides;* this laſt a modern name, the reaſon of which does not appear, unleſs it be a corruption of *Hebudes*. By Beda called *Mevaniæ*, an appellation equally obſcure.

EBULLITION, the ſame with Boiling. The word is alſo uſed in a ſynonymous ſenſe with Effervescence.

EBUSUS (anc. geog.), the greater of the two iſlands called Pityuſæ, in the Mediterranean, near the eaſt coaſt of Spain, to the ſouth-weſt of Majorca. Famous for its paſtures for cattle, and for its figs. Now *Ivica*, 100 miles in compaſs, without any noxious animals but rabbits, who often deſtroy the corn.

ECALESIA, Εκαλησια, in antiquity, a feſtival kept in honour of Jupiter, ſurnamed *Hecalus*, or *Hecaleſius*, from *Hecale*, one of the borough-towns in Attica.

ECASTOR, in antiquity, an oath wherein Caſtor was invoked. It was a cuſtom for the men never to ſwear by Caſtor, nor the women by Pollux.

ECATÆA, Εκαταια, in antiquity, ſtatues erected to the goddeſs Hecate, for whom the Athenians had a great veneration, believing that ſhe was the overſeer of their families, and that ſhe protected their children.

ECATESIA, Εκατησια, in antiquity, an anniverſary ſolemnity, obſerved by the Stratonicenſians, in honour of Hecate. The Athenians likewiſe had a public entertainment or ſupper every new moon, in honour of the ſame goddeſs. The ſupper was provided at the charge of the richer ſort; and was no ſooner brought to the accuſtomed place but the poor people carried all off, giving out that Hecate had devoured it. For the reſt of the ceremonies obſerved on this occaſion, ſee *Pott. Arch. Græc.* lib. ii. cap. 20.

ECATOMBÆON, Εκατομϐαιων, in chronology, the firſt month of the Athenian year. It conſiſted of 30 days, and began on the firſt new moon after the ſummer ſolſtice, and conſequently anſwered to the latter part of our June and beginning of July. The Bœotians called it *Hippodromus*, and the Macedonians *Lous*. See Month. The word is a derivative from the Greek ηκατομϐη, *a hecatomb*, becauſe of the great number of hecatombs ſacrificed in it.

ECAVESSADE, in the manege, is uſed for a jerk of the caveſſon.

ECBATANA (anc. geog.), the royal reſidence and the capital of Media, built by Deioces king of the Medes, according to Herodotus: Pliny ſays, by Seleucus; but that could not be, becauſe it is mentioned by Demoſthenes. It was ſituated on a gentle declivity, diſtant 12 ſtadia from Mount Orontes, and was in compaſs 150 ſtadia. Here ſtood the royal treaſury and tombs. It was an open unwalled town, but had a very ſtrong citadel, encompaſſed with ſeven walls, one within and riſing above another. The extent of the utmoſt was equal to the whole extent of Athens, according to Herodotus; the ſituation favouring this conſtruction, as being a gentle aſcent, and each wall was of a different colour.—Another *Ecbatana* of Perſia, a town of the Magi (Pliny).—A third of Syria.

ECCENTRICITY. See Excentricity.

ECCHELLENSIS (Abraham), a learned Maronite, whom the preſident le Jai employed in the edition of his Polyglott Bible. Gabriel Sionita, his countryman, drew him to Paris, in order to make him his fellow-labourer in publiſhing that bible. They fell out; Gabriel complained to the parliament, and cruelly defamed his aſſociate; their quarrel made a great noiſe. The congregation *de propaganda fide* aſſociated him, 1636, with thoſe whom they employed in making an Arabic tranſlation of the ſcripture. They recalled him from Paris, and he laboured in that tranſlation at Rome in the year 1652. While he was profeſſor of the Oriental languages at Rome, he was pitched upon by the great duke Ferdinand II. to tranſlate from Arabic into Latin the 5th, 6th, and 7th books of Apollonius's Conics; in which he was aſſiſted by John Alphonſo Borelli, who added commentaries to them. He died at Rome in 1664.

ECCHYMOSIS, from εκχυω to *pour out*, or from εξ, *out of*, and χυμος *juice*. It is an effuſion of humours from their reſpective veſſels, under the integuments; or, as Paulus Ægineta ſays, "When the fleſh is bruiſed by the violent colliſion of any object, and its ſmall veins broken, the blood is gradually diſcharged from them." This blood, when collected under the ſkin, is called an *ecchymoſis*, the ſkin in the mean time remaining entire; ſometimes a tumor is formed by it, which is ſoft and livid, and generally without pain. If the quantity of blood is not conſiderable, it is uſually reſorbed; if much, it ſuppurates: it rarely happens that

that any further inconvenience follows; though, in caſe of a very bad habit of body, a mortification may be the reſult, and in ſuch a caſe regard muſt be had thereto.

ECCLAIRCISSEMENT. See Esclaircissement

ECCLESIASTES, a canonical book of the Old Teſtament, the deſign of which is to ſhow the vanity of all ſublunary things.

It was compoſed by Solomon; who enumerates the ſeveral objects on which men place their happineſs, and then ſhows the inſufficiency of all worldly enjoyments.

The Talmudiſts made king Hezekiah to be the author of it; Grotius aſcribes it to Zorobabel, and others to Iſaiah; but the generality of commentators believe this book to be the produce of Solomon's repentance, after having experienced all the follies and pleaſures of life.

ECCLESIASTICAL, an appellation given to whatever belongs to the church: thus we ſay, eccleſiaſtical polity, juriſdiction, hiſtory, &c.

*Blackſt. Comment.*

*Ecclesiastical Courts.* In the time of the Anglo-Saxons there was no ſort of diſtinction between the lay and the eccleſiaſtical juriſdiction: the county-court was as much a ſpiritual as a temporal tribunal: the rights of the church were aſcertained and aſſerted at the ſame time, and by the ſame judges, as the rights of the laity. For this purpoſe the biſhop of the dioceſe, and the alderman, or in his abſence the ſheriff of the county, uſed to ſit together in the county-court, and had there the cognizance of all cauſes as well eccleſiaſtical as civil; a ſuperior deference being paid to the biſhop's opinion in ſpiritual matters, and to that of the lay-judges in temporal. This union of power was very advantageous to them both: the preſence of the biſhop added weight and reverence to the ſheriff's proceedings; and the authority of the ſheriff was equally uſeful to the biſhop, by enforcing obedience to his decrees in ſuch refractory offenders as would otherwiſe have deſpiſed the thunder of mere eccleſiaſtical cenſures.

But ſo moderate and rational a plan was wholly inconſiſtent with thoſe views of ambition that were then forming by the court of Rome. It ſoon became an eſtabliſhed maxim in the papal ſyſtem of policy, that all eccleſiaſtical perſons, and all eccleſiaſtical cauſes, ſhould be ſolely and entirely ſubject to eccleſiaſtical juriſdiction only: which juriſdiction was ſuppoſed to be lodged in the firſt place and immediately in the Pope, by divine indefeaſible right and inveſtiture from Chriſt himſelf, and derived from the Pope to all inferior tribunals. Hence the canon law lays it down as a rule, that "*ſacerdotes a regibus honorandi ſunt, non judicandi*; and places an emphatical reliance on a fabulous tale which it tells of the emperor Conſtantine, That when ſome petitions were brought to him, imploring the aid of his authority againſt certain of his biſhops accuſed of oppreſſion and injuſtice, he cauſed (ſays the holy canon) the petitions to be burnt in their preſence, diſmiſſing them with this valediction: "*Ite, et inter vos cauſas veſtras diſcutite, quia dignum non eſt ut nos judicemus Deos.*"

It was not, however, till after the Norman conqueſt, that this doctrine was received in England; when William I. (whoſe title was warmly eſpouſed by the monaſteries which he liberally endowed, and by the foreign clergy whom he brought over in ſhoals from France and Italy, and planted in the beſt preferments of the Engliſh church), was at length prevailed upon to eſtabliſh this fatal encroachment, and ſeparate the eccleſiaſtical court from the civil: whether actuated by principles of bigotry, or by thoſe of a more refined policy, in order to diſcountenance the laws of king Edward abounding with the ſpirit of Saxon liberty, is not altogether certain But the latter, if not the cauſe, was undoubtedly the conſequence, of this ſeparation: for the Saxon laws were ſoon overborne by the Norman juſticiaries, when the county-court fell into diſregard by the biſhop's withdrawing his preſence, in obedience to the charter of the conqueror; which prohibited any ſpiritual cauſe from being tried in the ſecular courts, and commanded the ſuitors to appear before the biſhop only, whoſe deciſions were directed to conform to the canon law.

King Henry I. at his acceſſion, among other reſtorations of the laws of king Edward the Confeſſor, revived this of the union of the civil and eccleſiaſtical courts. Which was, according to Sir Edward Coke, after the great heat of the conqueſt was paſt, only a reſtitution of the ancient law of England. This however was ill reliſhed by the Popiſh clergy, who, under the guidance of that arrogant prelate archbiſhop Anſelm, very early diſapproved of a meaſure that put them on a level with the profane laity, and ſubjected ſpiritual men and cauſes to the inſpection of the ſecular magiſtrates: and therefore, in their ſynod at Weſtminſter, 3 Hen. I. they ordained, that no biſhop ſhould attend the diſcuſſion of temporal cauſes; which ſoon diſſolved this newly effected union. And when, upon the death of king Henry I. the uſurper Stephen was brought in and ſupported by the clergy, we find one article of the oath which they impoſed upon him was, that eccleſiaſtical perſons and eccleſiaſtical cauſes ſhould be ſubject only to the biſhop's juriſdiction. And as it was about that time that the conteſt and emulation began between the laws of England and thoſe of Rome, the temporal courts adhering to the former, and the ſpiritual adopting the latter, as their rule of proceeding; this widened the breach between them, and made a coalition afterwards impracticable; which probably would elſe have been effected at the general reformation of the church.

Eccleſiaſtical Courts are various; as the Archdeacon's, the Consistory, the Court of Arches, the Peculiars, the Prerogative, and the great court of appeal in all eccleſiaſtical cauſes, viz. the Court of Delegates. See theſe articles.

*Blackſt. Comme*

As to the method of proceeding in the ſpiritual courts, it muſt (in the firſt place) be acknowledged to their honour, that though they continue to this day to decide many queſtions which are properly of temporal cognizance, yet juſtice is in general ſo ably and impartially adminiſtered in thoſe tribunals (eſpecially of the ſuperior kind), and the boundaries of their power are now ſo well known and eſtabliſhed, that no material inconvenience at preſent ariſes from this juriſdiction ſtill continuing in the ancient channel. And, ſhould any alteration be attempted, great confuſion would probably ariſe, in overturning long eſtabliſhed forms, ſiaſti- ourts.

forms, and new-modelling a courſe of proceedings that has now prevailed for ſeven centuries.

The eſtabliſhment of the civil-law proceſs in all the eccleſiaſtical courts was indeed a maſter-piece of papal diſcernment, as it made a coalition impracticable between them and the national tribunals, without manifeſt inconvenience and hazard. And this conſideration had undoubtedly its weight in cauſing this meaſure to be adopted, though many other cauſes concurred. In particular, it may be here remarked, that the pandects, or collections of civil law, being written in the Latin tongue, and referring ſo much to the will of the prince and his delegated officers of juſtice, ſufficiently recommended them to the court of Rome, excluſive of their intrinſic merit. To keep the laity in the darkeſt ignorance, and to monopolize the little ſcience which then exiſted entirely among the monkiſh clergy, were deep-rooted principles of papal policy. And as the biſhops of Rome affected in all points to mimic the imperial grandeur, as the ſpiritual prerogatives were moulded on the pattern of the temporal, ſo the canon-law proceſs was formed on the model of the civil law; the prelates embracing, with the utmoſt ardor, a method of judicial proceedings, which was carried on in a language unknown to the bulk of the people, which baniſhed the intervention of a jury (that bulwark of Gothic liberty), and which placed an arbitrary power of deciſion in the breaſt of a ſingle man.

The proceedings in the eccleſiaſtical courts are therefore regulated according to the practice of the civil and canon laws; or rather to a mixture of both, corrected and new-modelled by their own particular uſages, and the interpoſition of the courts of common law. For, if the proceedings in the ſpiritual court be ever ſo regularly conſonant to the rules of the Roman law, yet if they be manifeſtly repugnant to the fundamental maxims of the municipal laws, to which, upon principles of ſound policy, the eccleſiaſtical proceſs ought in every ſtate to conform (as if they require two witneſſes to prove a fact, where one will ſuffice at common law); in ſuch caſes, a prohibition will be awarded againſt them. But, under theſe reſtrictions, their ordinary courſe of proceeding is, firſt, by *citation*, to call the party injuring before them. Then by *libel* (*libellus*, "a little book"), or by articles drawn out in a formal *allegation*, to ſet forth the complainant's ground of complaint. To this ſucceeds the *defendant's anſwer* upon oath; when, if he denies or extenuates the charge, they proceed to *proofs* by witneſſes examined, and their depoſitions taken down in writing by an officer of the court. If the defendant has any circumſtances to offer in his defence, he muſt alſo propound them in what is called his *defenſive allegation*, to which he is intitled in his turn to the *plaintiff's anſwer* upon oath, and may from thence proceed to *proofs* as well as his antagoniſt. The canonical doctrine of *purgation*, whereby the parties were obliged to anſwer upon oath to any matter, however criminal, that might be objected againſt them (though long ago over-ruled in the court of chancery, the genius of the Engliſh law having broken through the bondage impoſed on it by its clerical chancellors, and aſſerted the doctrines of judicial as well as civil liberty), continued till the middle of the laſt century, to be upheld by the ſpiritual courts; when the legiſlature was obliged to interpoſe, to teach them a leſſon of ſimilar moderation. By the ſtatute of 13 Car. II. c. 12. it is enacted, that it ſhall not be lawful for any biſhop, or eccleſiaſtical judge, to tender or adminiſter to any perſon whatſoever, the oath uſually called the oath *ex officio*, or any other oath whereby he may be compelled to confeſs, accuſe, or purge himſelf of any criminal matter or thing, whereby he may be liable to any cenſure or puniſhment. When all the pleadings and proofs are concluded, they are referred to the conſideration, not of a jury, but of a ſingle judge; who *takes information* by hearing advocates on both ſides, and thereupon forms his *interlocutory decree* or *definitive ſentence*, at his own diſcretion: from which there generally lies an *appeal*, in the ſeveral ſtages mentioned in the articles above referred to; though if the ſame be not appealed from him in 15 days, it is final, by the ſtatute 25 Hen. VIII. c. 19.

But the point in which theſe juriſdictions are the moſt defective, is that of enforcing their ſentences when pronounced; for which they have no other proceſs but that of *excommunication*; which would be often deſpiſed by obſtinate or profligate men, did not the civil law ſtep in with its aid. See EXCOMMUNICATION.

Eccleſiaſtical Corporations

*ECCLESIASTICAL Corporations*, are where the members that compoſe them are *ſpiritual* perſons. They were erected for the furtherance of religion and perpetuating the rights of the church. See CORPORATIONS.

*ECCLESIASTICAL State*. See CLERGY.

ECCLESIASTICUS, an apocryphal book, generally bound up with the ſcriptures, ſo called, from its being read in the church, *eccleſia*, as a book of piety and inſtruction, but not of infallible authority.

The author of this book was a Jew, called *Jeſus the ſon of Sirach*. The Greeks call it the *Wiſdom of the ſon of Sirach*.

ECCOPROTICS, in medicine, laxative or looſening remedies, which purge gently, by ſoftening the humours and excrements, and fitting them for expulſion.—The word is compoſed of the Greek particle ἐκ, and *κοπρος excrement*.

ECDICI, Ἐκδικοι, among the ancients, patrons of cities, who defended their rights, and took care of the public money. Their office reſembled that of the modern ſyndics.

ECHAPE, in the manege, a horſe begot between a ſtallion and a mare of different breeds and countries.

ECHAPER, in the manege, a galliciſm uſed in the academies implying to give a horſe head, or to put on at full ſpeed.

Echeneis.

ECHENEIS, the REMORA, in ichthyology; a genus belonging to the order of thoracici. The head is fat, naked, depreſſed, and marked with a number of tranſverſe ridges; it has ten rays in the branchioſtege membrane; and the body is naked. There are two ſpecies, viz. 1. The remora, or ſucking-fiſh, with a forked tail, and 18 ſtriæ on the head. It is found in the Indian ocean. 2. The neucrates, with an undivided tail, and 16 ſtriæ on the head. It is likewiſe a native of the Indian ocean. Theſe fiſhes are often found adhering ſo ſtrongly to the ſides of ſharks and other great fiſh, by means of the ſtructure of its head, as to be got off with difficulty. This fiſh was believed, by all the ancients, to have moſt wonderful powers, and to be able, by adhering to the bottom, to arreſt the

Plate CLXXIII.

the motion of a ſhip in its fulleſt courſe; and in love affairs, to deaden the warmeſt affections of both ſexes (*Plin.* lib ix. c. 25.).

ECHEVIN, in the French and Dutch polity, a magiſtrate elected by the inhabitants of a city or town, to take care of their common concerns, and the decoration and cleanlineſs of the city.

At Paris, there is a prevôt and four echevins; in other towns, a mayor and echevins. At Amſterdam, there are nine echevins; and at Rotterdam, ſeven.

In France, the echevins take cognizance of rents, taxes, and the navigation of rivers, &c. In Holland, they judge of civil and criminal cauſes; and if the criminal confeſſes himſelf guilty, they can ſee their ſentence executed without appeal.

ECHINATE, or Echinated, an appellation given to whatever is prickly, thereby reſembling the hedgehog.

ECHINITES, in natural hiſtory, the name by which authors call the foſſile centronia, frequently found in our chalk-pits. See Centronia.

ECHINOPHORA, in botany: A genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The male florets are lateral, with the central one hermaphrodite; there is one ſeed, ſunk into an indurated involucrum.

ECHINOPS, in botany: A genus of the polygamia ſegregatæ order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The calyx is uniflorous; the corollulæ tubulated, and hermaphrodite; the receptacle briſtly: the pappus indiſtinct.

ECHINUS, in zoology, a genus of inſects belonging to the order of vermes molluſca. The body is roundiſh, covered with a bony cruſt, and often beſet with moveable prickles; and the mouth is below, and conſiſts of five valves. 1. The eſculentus, or eatable echinus, is of a hemiſpherical form, covered with ſharp ſtrong ſpines, above half an inch long; commonly of a violet colour; moveable; adherent to ſmall tubercles elegantly diſpoſed in rows. Theſe are their inſtruments of motion by which they change their place. This ſpecies is taken in dredging, and often lodges in cavities of rocks juſt within low water mark. They are eaten by the poor in many parts of England, and by the better ſort abroad. In old times they were a favourite diſh. They were dreſſed with vinegar, honied wine or mead, parſley or mint; and thought to agree with the ſtomach. They were the firſt diſh in the famous ſupper of Lentulus, when he was made *flamen Martialis*, or prieſt of Mars. By ſome of the concomitant diſhes, they ſeem to have been deſigned as a whet for the ſecond courſe, to the holy perſonages, prieſts and veſtals invited on that occaſion. Many ſpecies of ſhell-fiſh made part of that entertainment. 2. The lacunoſus, or oval echinus, is of an oval depreſſed form; on the top it is of a purple colour, marked with a quadrefoil, and the ſpaces between tuberculated in waved rows; the lower ſide ſtudded, and divided by two ſmooth ſpaces. Length, four inches. When clothed, it is covered with ſhort thickſet briſtles mixed with very long ones. There are 15 other ſpecies, all natives of the ſea. See two ſpecimens delineated on Plate CLXXIII.

Echinus, in architecture, a member or ornament near the bottom of the Ionic, Corinthian, and Compoſite capitals.

ECHITES, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 30th order, *Contortæ*. There are two long and ſtraight follicles; the ſeeds pappous; the corolla funnel-ſhaped, with the throat naked. The corymboſa, a ſpecies of this genus, is ſuppoſed to yield the elaſtic gum according to Jaquin. See Caoutchouc.

ECHIUM, viper's bugloss, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 41ſt order, *Aſperifoliæ*. The corolla is irregular, with the throat naked. There are ſeven ſpecies, three of which are natives of Britain. None of them have any remarkable property, except that the flowers of one ſpecies (the vulgare) are very grateful to bees. It is a native of many parts of Britain. The ſtem is rough with hairs and tubercles. The leaves are ſpear-ſhaped, and rough with hair. The flowers come out in lateral ſpikes. They are firſt red, afterwards blue; ſometimes purple or white.—Cows and ſheep are not fond of the plant; horſes and goats refuſe it.

ECHO, or Eccho, a ſound reflected or reverberated, from a ſolid, concave, body, and ſo repeated to the ear *. The word is formed from the Greek ηχος *ſound*, which comes from the verb ηχω *ſono*.

The ancients being wholly unacquainted with the true cauſe of the echo, aſcribed it to ſeveral cauſes ſufficiently whimſical. The poets, who were not the worſt of their philoſophers, imagined it to be a perſon of that name metamorphoſed, and that ſhe affected to take up her abode in particular places; for they found by experience, that ſhe was not to be met with in all. (See below, Echo in *fabulous hiſtory*) But the moderns, who know ſound to conſiſt in a certain tremor or vibration in the ſonorous body communicated to the contiguous air, and by that means to the ear, give a more conſiſtent account of echo.

For a tremulous body, ſtriking on another ſolid body, it is evident, may be repelled without deſtroying or diminiſhing its tremor; and conſequently a ſound may be redoubled by the reſilition of the tremulous body, or air.

But a ſimple reflexion of the ſonorous air, is not enough to ſolve the echo: for then every plain ſurface of a ſolid hard body, as being fit to reflect a voice or ſound, would redouble it; which we find does not hold.

To produce an echo, therefore, it ſhould ſeem that a kind of concameration or vaulting were neceſſary, in order to collect, and by collecting to heighten and increaſe, and afterwards reflect, the ſound; as we find is the caſe in reflecting the rays of light, where a concave mirror is required.

In effect, as often as a ſound ſtrikes perpendicularly on a wall, behind which is any thing of a vault or arch, or even another parallel wall; ſo often will it be reverberated in the ſame line, or other adjacent ones.

For an echo to be heard, therefore, it is neceſſary the ear be in the line of reflection: for the perſon who made the ſound to hear its echo, it is neceſſary he be

* See
ſics, n

perpendicular to the place which reflects it: and for a manifold or tautological echo, it is neceſſary there be a number of walls, and vaults or cavities, either placed behind or fronting each other.

A ſingle arch or concavity, &c. can ſcarce ever ſtop and reflect all the ſound; but if there be a convenient diſpoſition behind it, part of the ſound propagated thither, being collected and reflected as before, will preſent another echo: or, if there be another concavity, oppoſed at a due diſtance to the former, the ſound reflected from the one upon the other will be toſſed back again by this latter, &c.

Many of the phenomena of echos are well conſidered by the biſhop of Leighs, &c. who remarks, that any ſound, falling either directly or obliquely on any denſe body of a ſmooth, whether plain or arched, ſuperficies, is reflected, or echoes, more or leſs. The ſurface, ſays he, muſt be ſmooth; otherwiſe the air, by reverberation, will be put out of its regular motion, and the ſound thereby broken and extinguiſhed. He adds, that it echoes more or leſs, to ſhow, that when all things are as before deſcribed, there is ſtill an echoing, tho' it be not always heard: either becauſe the direct ſound is too weak to beat quite back again to him that made it; or that it does return to him, but ſo weak, that it cannot be diſcerned; or that he ſtands in a wrong place to receive the reflected ſound, which paſſes over his head, under his feet, or on one ſide of him; and which therefore may be heard by a man ſtanding in the place where the reflected ſound does come, provided no interpoſed body intercepts it, but not by him that firſt made it.

Echoes may be produced with different circumſtances. For, 1. A *plane* obſtacle reflects the ſound back in its due tone and loudneſs; allowance being made for the proportionable decreaſe of the ſound, according to its diſtance.

2. A *convex* obſtacle reflects the ſound ſomewhat ſmaller and ſomewhat quicker, though weaker, than otherwiſe it would be.

3. A *concave* obſtacle echoes back the ſound, bigger, ſlower, and alſo inverted; but never according to the order of words.

Nor does it ſeem poſſible to contrive any ſingle echo, that ſhall invert the ſound, and repeat backwards; becauſe, in ſuch caſe, the word laſt ſpoken, that is, which laſt occurs to the obſtacle, muſt be repelled firſt; which cannot be. For where in the mean time ſhould the firſt words hang and be concealed; or how, after ſuch a pauſe, be revived, and animated again into motion?

From the determinate concavity or archedneſs of the reflecting bodies, it may happen that ſome of them ſhall only echo back one determinate note, and only from one place.

4. The echoing body being removed farther off, it reflects more of the ſound than when nearer; which is the reaſon why ſome echoes repeat but one ſyllable, ſome one word, and ſome many.

5. Echoing bodies may be ſo contrived and placed, as that reflecting the ſound from one to the other, either directly and mutually, or obliquely and by ſucceſſion, out of one ſound, a multiple echo or many echoes ſhall ariſe.

Add, that a multiple echo may be made, by ſo placing the echoing bodies at unequal diſtances, that they may reflect all one way, and not one on the other; by which means, a manifold ſucceſſive ſound will be heard; one clap of the hands, like many; one *ha*, like a laughter; one ſingle word, like many of the ſame tone and accent; and ſo one viol, like many of the ſame kind, imitating each other.

Echo.

Laſtly, echoing bodies may be ſo ordered, that from any one ſound given, they ſhall produce many echoes different both as to tone and intention. By which means a muſical room may be ſo contrived, that not only one inſtrument playing therein ſhall ſeem many of the ſame ſort and ſize, but even a concert of different ones, only by placing certain echoing bodies ſo, that any note played ſhall be returned by them in 3ds, 5ths, and 8ths.

Echo, is alſo uſed for the place where the repetition of the ſound is produced or heard.

Echoes are diſtinguiſhed into divers kinds, *viz.*

1. *Single*, which return the voice but once. Whereof ſome are *tonical*, which only return a voice when modulated into ſome particular muſical tone: Others, *polyſyllabical*, which return many ſyllables, words, and ſentences. Of this laſt kind is that fine echo in Woodſtock-park, which Dr Plot aſſures us, in the day-time, will return very diſtinctly ſeventeen ſyllables, and in the night twenty.

2. *Multiple*, or *tautoligical*; which return ſyllables and words the ſame oftentimes repeated.

In echoes, the place where the ſpeaker ſtands is called the *centrum phonicum;* and the object or place that returns the voice, the *centrum phonocampticum*.

At the ſepulchre of Metella, wife of Craſſus, was an echo, which repeated what a man ſaid five times. Authors mention a tower at Cyzicus, where the echo repeated ſeven times. One of the fineſt echoes we read of is that mentioned by Barthius, in his notes on Statius's *Thebais*, lib. vi. 30. which repeated the words a man uttered 17 times: it was on the banks of the Naha, between Coblentz and Bingen. Barthius aſſures us, he had proved what he writes; and had told 17 repetitions. And whereas, in common echoes, the repetition is not heard till ſome time after hearing the word ſpoke, or the notes ſung; in this, the perſon who ſpeaks or ſings is ſcarce heard at all; but the repetition moſt clearly, and always in ſurpriſing varieties; the echo ſeeming ſometimes to approach nearer, and ſometimes to be further off. Sometimes the voice is heard very diſtinctly, and ſometimes ſcarce at all. One hears only one voice, and another ſeveral: one hears the echo on the right, and the other on the left, &c. At Milan in Italy, is an echo which reiterates the report of a piſtol 56 times; and if the report is very loud, upwards of 60 reiterations may be counted. The firſt 20 echoes are pretty diſtinct; but as the noiſe ſeems to fly away, and anſwer at a greater diſtance, the reiterations are ſo doubled, that they can ſcarce be counted. See an account of a remarkable echo under the article Paisley.

Echo, in architecture, a term applied to certain kinds of vaults and arches, moſt commonly of the elliptic and parabolic figures, uſed to redouble ſounds, and produce artificial echoes.

Echo, in poetry, a kind of compoſition wherein the laſt words or ſyllables of each verſe contains ſome meaning, which, being repeated apart, anſwers to ſome queſtion

ſtion or other matter contained in the verſe; as in this beautiful one from Virgil:

*Crudelis mater magis, an puer improbus ille?*
*Improbus ille puer, crudelis tu quoque mater.*

The elegance of an echo conſiſts in giving a new ſenſe to the laſt words; which reverberate, as it were, the motions of the mind, and by that means affect it with ſurpriſe and admiration.

Echo, in fabulous hiſtory, a daughter of the Air and Tellus, who chiefly reſided in the vicinity of the Cephiſus. She was once one of Juno's attendants, and became the confident of Jupiter's amours. Her loquacity however diſpleaſed Jupiter, and ſhe was deprived of the power of ſpeech by Juno, and only permitted to anſwer to the queſtions which were put to her. Pan had formerly been one of her admirers, but he never enjoyed her favours. Echo, after ſhe had been puniſhed by Juno, fell in love with Narciſſus; but being deſpiſed by him, pined herſelf to death, having nothing but her voice left.

ECHOMETER, among muſicians, a kind of ſcale or rule, with ſeveral lines thereon, ſerving to meaſure the duration and length of ſounds, and to find their intervals and ratios.

ECHOUERIES. See under Trichecus.

ECKIUS (John), an eminent and learned divine, profeſſor in the univerſity of Ingoldſtadt, memorable for the oppoſition he gave to Luther, Melancthon, Caraloſtadius, and other leading Proteſtants in Germany. He wrote many polemical tracts; and among the reſt, a *Manual of Controverſies*, printed in 1535, in which he diſcourſes upon moſt of the heads conteſted between the Proteſtants and Papiſts. He was a man of uncommon learning, parts, and zeal, and died in 1543.

ECLECTICS *(eclectici)*, a name given to ſome ancient philoſophers, who, without attaching themſelves to any particular ſect, took what they judged good, and ſolid, from each. Hence their denomination; which, in the original Greek, ſignifies, "that may be choſen," or "that chooſes;" of the verb εκλεγω *I chooſe.*—Laertius notes, that they were alſo, for the ſame reaſon, denominated *analogetici;* but that they call themſelves *Philalethes*, i. e. lovers of truth.

The chief or founder of the eclectici was one Potamon of Alexandria, who lived under Auguſtus and Tiberius; and who, weary of doubting of all things with the Sceptics and Pyrrhonians, formed the eclectic ſect; which Voſſius calls the *eclective.*

Towards the cloſe of the ſecond century a ſect aroſe in the Chriſtian church under the denomination of *Eclectics*, or modern *Platonics*. They profeſſed to make truth the only object of their enquiry, and to be ready to adopt from all the different ſyſtems and ſects, ſuch tenets as they thought agreeable to it. However, they preferred Plato to the other philoſophers, and looked upon his opinions concerning God, the human ſoul, and things inviſible, as conformable to the ſpirit and genius of the Chriſtian doctrine. One of the principal patrons of this ſyſtem was Ammonius Saccas, who at this time laid the foundation of that ſect, afterwards diſtinguiſhed by the name of the new *Platonics*, in the Alexandrian ſchool. See Ammonius and Platonists.

Eclectics were alſo a certain ſet of phyſicians among the ancients, of whom Archigenes, under Trajan, was the chief, who ſelected from the opinions of all the other ſects, that which appeared to them beſt and moſt rational; hence they were called *eclectics*, and their preſcriptions *medicina eclectica.*

ECLIPSE, in aſtronomy, the deprivation of the light of the ſun, or of ſome heavenly body, by the interpoſition of another heavenly body between our ſight and it. See Astronomy-*Index.*

ECLIPTA, in botany; a genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants. The receptacle is chaffy; there is no pappus, and the corollulæ of the diſk quadrifid.

ECLIPTIC, in aſtronomy, a great circle of the ſphere, ſuppoſed to be drawn through the middle of the zodiac, making an angle with the equinoctial of about 23° 30', which is the ſun's greateſt declination; or, more ſtrictly ſpeaking, it is that path or way among the fixed ſtars, that the earth appears to deſcribe to an eye placed in the ſun. See Astronomy-*Index.*

Some call it *via Solis*, "the way of the ſun;" becauſe the ſun in his apparent annual motion never deviates from it, as all the other planets do more or leſs.

Ecliptic, in geography, a great circle on the terreſtrial globe, not only anſwering to, but falling within, the plane of the celeſtial ecliptic. See Geography.

ECLOGUE, in poetry, a kind of paſtoral compoſition, wherein ſhepherds are introduced converſing together. The word is formed from the Greek εκλογη *choice;* ſo that, according to the etymology, *eclogue* ſhould be no more than a ſelect or choice piece; but cuſtom has determined it to a farther ſignification, viz. a little elegant compoſition in a ſimple natural ſtyle and manner.

Idyllion and eclogue, in their primary intention, are the ſame thing: thus, the idyllia, ειδυλλια, of Theocritus, are pieces wrote perfectly in the ſame vein with the *ecloga* of Virgil. But cuſtom has made a difference between them, and appropriated the name *eclogue* to pieces wherein ſhepherds are introduced ſpeaking; *idyllion*, to thoſe wrote like the eclogue, in a ſimple natural ſtyle, but without any ſhepherds in them.

ECLUSE, a ſmall but ſtrong town of the Dutch Low Countries, in the county of Flanders, with a good harbour and ſluices. The Engliſh beſieged it in vain in 1405, and the people of Bruges in 1436. But the Dutch, commanded by Count Maurice of Naſſau, took it in 1644. It is defended by ſeveral forts, and ſtands near the ſea. E. Long. 3. 10. N. Lat. 50. 25.

ECPHRACTICS, in medicine, remedies which attenuate and remove obſtructions. See Attenuants, and Deobstruents.

ECSTASY. See Extasy.

ECSTATICI, Εκςατικοι, from εξιςημι *I am entranced*, in antiquity, a kind of diviners who were caſt into trances or ecſtaſies, in which they lay like dead men, or aſleep, deprived of all ſenſe and motion; but, after ſome time, returning to themſelves, gave ſtrange relations of what they had ſeen and heard.

ECTHESIS, in church-hiſtory, a confeſſion of faith, in the form of an edict, publiſhed in the year 639, by the emperor Heraclius, with a view to pacify the troubles occaſioned by the Eutychian hereſy in the eaſtern church. However, the ſame prince revoked it, on on being informed that pope Severinus had condemned it, as favouring the Monothelites; declaring at the ſame time, that Sergius, patriarch of Conſtantinople, was the author of it.

ECTHLIPSIS, among Latin grammarians, a figure of proſody whereby the *m* at the end of a word, when the following word begins with a vowel, is elided, or cut off, together with the vowel preceding it, for the ſake of the meaſure of the verſe: thus they read *mult' ille*, or *multum ille*.

ECTROPIUM, in ſurgery, is when the eye-lids are inverted, or retracted, ſo that they ſhow their internal or red ſurface, and cannot ſufficiently cover the eye.

ECTYLOTICS, in pharmacy, remedies proper for conſuming calloſities.

ECU, or Escu, a French crown; for the value of which, ſee Money.

EDDA, in antiquities, is a ſyſtem of the ancient Icelandic or Runic mythology, containing many curious particulars of the theology, philoſophy, and manners, of the northern nations of Europe; or of the Scandinavians, who had migrated from Aſia, and from whom our Saxon anceſtors were deſcended. Mr Mallet apprehends that it was originally compiled, ſoon after the Pagan religion was aboliſhed, as a courſe of poetical lectures, for the uſe of ſuch young Icelanders as devoted themſelves to the profeſſion of a *ſcald* or poet. It conſiſts of two principal parts; the *firſt* containing a brief ſyſtem of mythology, properly called the *Edda;* and the *ſecond* being a kind of art of poetry, and called *ſcalda* or *poetics*. The moſt ancient Edda was compiled by Soemund Sigfuſſon, ſurnamed the *Learned*, who was born in Iceland about the year 1057. This was abridged, and rendered more eaſy and intelligible about 120 years afterwards, by Snorro Sturleſon, who was ſupreme judge of Iceland in the years 1215 and 1222; and it was publiſhed in the form of a dialogue. He added alſo the ſecond part in the form of a dialogue, being a detail of different events tranſacted among the divinities. The only three pieces that are known to remain of the more ancient Edda of Soemund, are the Voluſpa, the Havamaal, and the Runnic chapter. The Voluſpa, or prophecy of Vola or Fola, appears to be the text, on which the Edda is the comment. It contains in two or three hundred lines the whole ſyſtem of mythology, diſcloſed in the Edda, and may be compared to the Sibylline verſes, on account of its laconic yet bold ſtyle, and its imagery and obſcurity. It is profeſſedly a revelation of the decrees of the Father of nature, and the actions and operations of the gods. It deſcribes the chaos, the formation of the world, with its various inhabitants, the function of the gods, their moſt ſignal adventures, their quarrels with Loke their great adverſary, and the vengeance that enſued; and concludes with a long deſcription of the final ſtate of the univerſe, its diſſolution and conflagration, the battle of the inferior deities, and the evil beings, the renovation of the world, the happy lot of the good, and the puniſhment of the wicked. The Havamaal, or Sublime Diſcourſe, is attributed to the god Odin, who is ſuppoſed to have given theſe precepts of wiſdom to mankind; it is compriſed in about 120 ſtanzas, and reſembles the book of Proverbs. Mr Mallet has given ſeveral extracts of this treatiſe on the Scandinavian ethics. The Runic chapter contains a ſhort ſyſtem of ancient magic, and eſpecially of the enchantments wrought by the operation of Runic characters, of which Mr Mallet has alſo given a ſpecimen. A manuſcript copy of the Edda of Snorro is preſerved in the library of the univerſity of Upſal; the firſt part of which hath been publiſhed with a Swediſh and Latin verſion by M. Goranſon. The Latin verſion is printed as a ſuppliment to M. Mallet's Northern Antiquities. The firſt edition of the Edda was publiſhed by Reſenius, profeſſor at Copenhagen, in a large quarto volume, in the year 1665; containing the text of the Edda, a Latin tranſlation by an Icelandic prieſt, a Daniſh verſion, and various readings from different MSS. M. Mallet has alſo given an Engliſh tranſlation of the firſt part, accompanied with remarks; from which we learn, that the Edda teaches the doctrine of the Supreme, called the *Univerſal Father*, and *Odin*, who lives for ever, governs all his kingdom, and directs the great things as well as the ſmall; who formed the heaven, earth, and air; made man, and gave him a ſpirit or ſoul, which ſhall live, after the body ſhall have mouldered away; and then all the juſt ſhall dwell with him in a place *Gimle* or *Vingolf*, the palace of friendſhip; but wicked men ſhall go to Hela, or death, and from thence to Niſlheim, or the abode of the wicked, which is below in the ninth world. It inculcates alſo the belief of ſeveral inferior gods and goddeſſes, the chief of whom is Frigga or Frea, i. e. *lady*, meaning hereby the earth, who was the ſpouſe of Odin. or the Supreme God; whence we may infer that, according to the opinion of theſe ancient philoſophers, this Odin was the active principle or ſoul of the world, which uniting itſelf with matter, had thereby put it into a condition to produce the intelligences or inferior gods, and men and all other creatures. The Edda likewiſe teaches the exiſtence of an evil being called *Loke*, the calumniator of the gods, the artificer of fraud, who ſurpaſſes all other beings in cunning and perfidy. It teaches the creation of all things out of an abyſs or chaos; the final deſtruction of the world by fire; the abſorption of the inferior divinities, both good and bad, into the boſom of the grand divinity, from whom all things proceeded, as emanations of his eſſence, and who will ſurvive all things; and the renovation of the earth in an improved ſtate.

EDDISH, or Eadish, the latter paſture or graſs that comes after mowing or reaping; otherwiſe called *eagraſs* or *earſh*, and *etch*.

EDDOES or Edders, in botany; the American name of the Arum *eſculentum*.

EDDY (Saxon), of *ed* "backward," and *ea* "water," among ſeamen, is where the water runs back contrary to the tide; or that which hinders the free paſſage of the ſtream, and ſo cauſes it to return again. That eddy water which falls back, as it were, on the rudder of a ſhip under ſail, the ſeamen call the *dead water*.

*Eddy-Wind* is that which returns or is beat back from a ſail, mountain, or any thing that may hinder its paſſage.

EDELINCK (Gerard), a famous engraver, born at Antwerp, where he was inſtructed in drawing and engraving. He ſettled at Paris, in the reign of Louis XIV. who made him his engraver in ordinary. Edelinck was alſo counſellor in the Royal Academy of Painting. His works are particularly eſteemed for the neatneſs of the engraving, their brilliant caſt, and the prodigious eaſe apparent in the execution; and to this facility is owing the great number of plates we have of his; among which are excellent portraits of a great number of illuſtrious men of his time. Among the moſt admired of his prints, the following may be ſpecified as holding the chief place. 1. A Battle between four Horſemen, with three figures lying ſlain upon the ground, from Leonardo da Vinci. 2. A holy Family, with Elizabeth, St John, and two Angels, from the famous picture of Raphael in the king of France's collection. The firſt impreſſions are before the arms of M. Colbert were added at the bottom of the plate; the ſecond are with the arms; and in the third the arms are taken out, but the place where they had been inſerted is very perceptible. 3. Mary Magdalen bewailing her ſins, and trampling upon the riches of the world, from Le Brun. The firſt impreſſions are without the narrow border which ſurrounds the print. 4. Alexander entering into the Tent of Darius, a large print on two plates, from Le Brun. This engraving belongs to the three battles, and triumphal entry of Alexander into Babylon, by Girard Audran, and completes the ſet. The firſt impreſſions have the name of *Goyton* the printer at the bottom. 5. Alexander entering into the Tent of Darius (finiſhed by P. Drevet), from Peter Mignard. Edelinck died in 1707, in an advanced age, at the Hotel Royal at the Gobelins, where he had an apartment. He had a brother named *John*, who was a ſkilful engraver, but died young.

EDEN (Moſes), the name of a country, with a garden, in which the progenitors of mankind were ſettled by God himſelf: The term denotes pleaſure or delight. It would be endleſs to recount the ſeveral opinions concerning its ſituation, ſome of them very wild and extravagant. Moſes ſays, that "a river went out of Eden to water the garden, and from thence it was parted and became into four heads." This river is ſuppoſed to be the common channel of the Euphrates and Tigris, after their confluence; which parted again, below the garden, into two different channels: ſo that the two channels before, and the other two after their confluence, conſtitute the heads mentioned by Moſes. Which will determine the ſituation of the garden to have been in the ſouth of Meſopotamia, or in Babylonia. The garden was alſo called *Paradiſe;* a term of Perſic original, denoting a garden. See PARADISE.

EDGINGS, in gardening, the ſeries of ſmall but durable plants, ſet round the edges or borders of flower-beds, &c. The beſt and moſt durable of all plants for this uſe, is box; which, if well planted, and rightly managed, will continue in ſtrength and beauty for many years. The ſeaſons for planting this, are the autumn, and very early in the ſpring: and the beſt ſpecies for this purpoſe is the dwarf Dutch box.

Formerly, it was alſo a very common practice to plant borders, or edgings, of aromatic herbs; as thyme, ſavory, hyſſop, lavender, and the like: but theſe are all apt to grow woody, and to be in part, or wholly, deſtroyed in hard winters. Daiſies, thrift, or ſea july-flower, and camomile, are alſo uſed by ſome for this purpoſe: but they require yearly tranſplanting, and a great deal of trouble, elſe they grow out of form; and they are alſo ſubject to periſh in very hard ſeaſons.

EDHILING, EDHILINGUS, an ancient appellation of the nobility among the Anglo-Saxons.

The Saxon nation, ſays Nithard (Hiſt. lib. iv.) is divided into three orders or claſſes of people; the *edhilingi*, the *frilingi*, and the *lazzi;* which ſignify the nobility, the freemen, and the vaſſals or ſlaves.

Inſtead of *edhiling*, we ſometimes meet with *atheling*, or *ætheling;* which appellation was likewiſe given to the king's ſon, and the preſumptive heir of the crown. See ATHELING.

EDICT, in matters of polity, an order or inſtrument, ſigned and ſealed by a prince, to ſerve as a law to his ſubjects. We find frequent mention of the edicts of the prætor, the ordinances of that officer in the Roman law. In the French law, the edicts are of ſeveral kinds: ſome importing a new law or regulation; others, the erection of new offices; eſtabliſhments of duties, rents, &c.; and ſometimes articles of pacification. In France, edicts are much the ſame as a proclamation is with us: but with this difference, that the former have the authority of a law in themſelves, from the power which iſſues them forth; whereas the latter are only declarations of a law, to which they refer, and have no power in themſelves.

EDILE, or ÆDILE. See ÆDILE.

EDINBURGH, a city of Mid-Lothian in Scotland, ſituated in W. Long. 3°, and N. Lat. 56°, near the ſouthern bank of the river Forth.—The origin of the name, like that of moſt other cities, is very uncertain. Some imagine it to be derived from Eth, a ſuppoſed king of the Picts; others from Edwin, a Saxon prince of Northumberland, who over-ran the whole or greateſt part of the territories of the Picts about the year 617; while others chooſe to derive it from two Gaelic words *Dun Edin*, ſignifying the face of a hill. The name *Edinburgh* itſelf, however, ſeems to have been unknown in the time of the Romans. The moſt ancient title by which we find this city diſtinguiſhed is that of *Caſtelh Mynyd Agned;* which, in the Britiſh language, ſignifies "the fortreſs of the hill of St Agnes." Afterwards it was named *Caſtrum Puellarum*, becauſe the Pictiſh princeſſes were educated in the caſtle (a neceſſary protection in thoſe barbarous ages) till they were married.—The ages in which theſe names were given cannot indeed now be exactly aſcertained: but the town certainly cannot boaſt of very great antiquity; ſince, as Mr Whittaker informs us, the celebrated King Arthur fought a battle on the ſpot where it is ſituated towards the end of the fifth century.

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The Romans, during the time they held the dominion of part of this iſland, divided their poſſeſſions into ſix provinces. The moſt northerly of theſe was called *Valentia*, which comprehended all the ſpace between the walls of ADRIAN and SEVERUS. Thus, Edinburgh, lying on the very out-ſkirts of that province which was moſt expoſed to the ravages of the barbarians, became

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perpetually ſubject to wars and devaſtations; by means of which, the time of its firſt foundation cannot now be gueſſed at.

The caſtle is certainly very ancient. It continued in the hands of the Saxons or Engliſh from the invaſion of Octa and Ebuſa in the year 452 till the defeat of Egfrid king of Northumberland in 685 by the Picts, who then repoſſeſſed themſelves of it. The Saxon kings of Northumberland reconquered it in the ninth century; and it was retained by their ſucceſſors till the year 956, when it was given up to Indulphus king of Scotland. In 1093 it was unſucceſsfully beſieged by the uſurper Donald Bane. Whether the city was at that time founded or not is uncertain. Moſt probably it was: for as protection from violence was neceſſary in thoſe barbarous ages, the caſtle of Edinburgh could not fail of being an inducement to many people to ſettle in its neighbourhood; and thus the city would gradually be founded and increaſe.—In 1128, King David I. founded the Abbey of Holyroodhouſe, for certain canons regular; and granted them a charter, in which he ſtyled the town *Burgo meo de Edwineſburg*, "my borough of Edinburgh." By the ſame charter he granted theſe canons 40 ſhillings yearly out of the town revenues; and likewiſe 48 ſhillings more, from the ſame, in caſe of the failure of certain duties payable from the king's revenue; and likewiſe one half of the tallow, lard, and hides, of all the beaſts killed in Edinburgh.

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In 1174, the caſtle of Edinburgh was ſurrendered to Henry II. of England, in order to purchaſe the liberty of King William I. who had been defeated and taken priſoner by the Engliſh. But when William recovered his liberty, he entered into an alliance with Henry, and married his couſin Ermengarde; upon which the caſtle was reſtored as part of the queen's dower.

In 1215, this city was firſt diſtinguiſhed by having a parliament and provincial ſynod held in it.—In 1296, the caſtle was beſieged and taken by Edward I. of England; but was recovered in 1313 by Randolf Earl of Moray, who was afterwards regent of Scotland during the minority of King David II. At laſt King Robert deſtroyed this fortreſs, as well as all others in Scotland, leſt they ſhould afford ſhelter to the Engliſh in any of their after incurſions into Scotland.—It lay in ruins for a conſiderable number of years; but was afterwards rebuilt by Edward III. of England, who placed a ſtrong garriſon in it.

In 1341 it was reduced by the following ſtratagem. A man, pretending to be an Engliſh merchant, came to the governor, and told him that he had on board his ſhip in the Forth ſome wine, beer, biſcuits, &c. which he would ſell him on very reaſonable terms. A bargain being made, he promiſed to deliver the goods next morning at a very reaſonable rate: but at the time appointed, twelve men, diſguiſed in the habit of ſailors, entered the caſtle with the goods and ſuppoſed merchant; and having inſtantly killed the porter and centinels, Sir William Douglas, on a preconcerted ſignal, ruſhed in with a band of armed men, and quickly made himſelf maſter of the place, after having cut moſt of the garriſon in pieces.

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The year 1437 is remarkable for the execution of the Earl of Athol and his accomplices, who had a concern in the murder of James I. The crime, it muſt be owned, was execrable; but the puniſhment was altogether ſhocking to humanity. For three days ſucceſſively the aſſaſſins were tortured by putting on their heads iron crowns heated red hot, diſlocating their joints, pinching their fleſh with red hot pincers, and carrying them in that dreadful ſituation through the ſtreets upon hurdles. At laſt an end was put to their ſufferings, by cutting them up alive, and ſending the parts of their mangled bodies to the principal towns of the kingdom.

Edinburgh.

5
Edinburgh become the capital of Scotland.

About the end of the 14th century it was cuſtomary to conſider Edinburgh as the capital of the kingdom. The town of Leith, with its harbour and mills, had been beſtowed upon it by Robert I. in 1329; and his grandſon John Earl of Carrick, who afterwards aſcended the throne by the name of Robert III. conferred upon all the burgeſſes the ſingular privilege of building houſes in the caſtle, upon the ſole condition that they ſhould be perſons of good fame; which we muſt undoubtedly conſider as a proof that the number of theſe burgeſſes was at that time very ſmall. In 1461 a very conſiderable privilege was conferred on the city by Henry VI. of England when in a ſtate of exile; *viz.* that its inhabitants ſhould have liberty to trade to all the Engliſh ports on the ſame terms with the city of London. This extraordinary privilege was beſtowed in conſequence of the kindneſs with which that king was treated in a viſit to the Scottiſh monarch at Edinburgh; but as Henry was never reſtored, his gratitude was not attended with any benefit to this city. From this time, however, its privileges continued to be increaſed from various cauſes. In 1482 the citizens had an opportunity of liberating King James from the oppreſſion of his nobles, by whom he had been impriſoned in the caſtle. On this account the provoſt was by that monarch made hereditary high ſheriff within the city, an office which he continues ſtill to enjoy. The council at the ſame time were inveſted with the power of making laws and ſtatutes for the government of the city; and the trades, as a teſtimony of the royal gratitude for their loyalty, received the banner known by the name of the *Blue Blanket*; an enſign formerly capable of producing great commotions, but which has not now been diſplayed for many years paſt. However, it ſtill exiſts; and the convener of the trades has the charge of keeping it.

6
Venereal diſeaſe imported.

It was not long after the diſcovery of America that the venereal diſeaſe, imported from that country, made its way to Edinburgh. As early as 1497, only five years after the voyage of Columbus, we find it looked upon as a moſt dreadful plague; and the unhappy perſons affected with it were ſeparated as effectually as poſſible from ſociety. The place of their exile was Inchkeith, a ſmall iſland near the middle of the Forth; which, ſmall as it is, has a ſpring of freſh water, and now affords paſture to ſome ſheep.

7
Origin of the town-guard.

By the overthrow of James IV. at the battle of Flowden, the city of Edinburgh was overwhelmed with grief and confuſion, that monarch having been attended in his unfortunate expedition by the Earl of Angus, then provoſt, with the reſt of the magiſtrates, and a number of the principal inhabitants, moſt of whom periſhed in the battle. After this diſaſter, the inhabitants being alarmed for the ſafety of their city, Edinburgh.

it was enacted that every fourth man ſhould keep watch at night; the fortifications of the town were renewed, the wall being alſo extended in ſuch a manner as to incloſe the Graſsmarket, and the field on which Heriot's Hoſpital, the Grey Friars Church, and Charity Workhouſe, ſtand. On the eaſt ſide it was made to incloſe the College, Infirmary, and High School; after which, turning to the north, it met the old wall at the Netherbow-port. After this alarm was over, the inhabitants were gradually relieved from the trouble of watching at night, and a certain number of militia appointed to prevent diſturbances; who continue to this day, and are known by the name of the *Town Guard*. Before theſe new incloſures, moſt of the principal people lived in the Cowgate without the wall; and the burying-place was ſituated where the Parliament Cloſe now is. In our days of peace, when no alarm of an enemy is at all probable, great part of the walls, with all the gates, have been taken down, and the city laid quite open, in order to afford more ready paſſage to the great concourſe of people with whom the ſtreet is daily filled. But at the period we ſpeak of, not only were the inhabitants much leſs numerous by reaſon of the ſmall extent of the city, but it was depopulated by a dreadful plague; ſo that, to ſtop if poſſible the progreſs of the infection, all houſes and ſhops were ſhut up for 14 days, and ſome where infected perſons had died were pulled down altogether.

8
Erection of wooden houſes.

In 1504, the tract of ground called the *Burrough Muir* was totally overgrown with wood, though now it affords not the ſmalleſt veſtige of having been in ſuch a ſtate. So great was the quantity at that time, however, that it was enacted by the town-council, that whoever inclined to purchaſe as much wood as was ſufficient to make a new front for their houſe, might extend it ſeven feet into the ſtreet. Thus the city was in a ſhort time filled with houſes of wood inſtead of ſtone; by which, beſides the inconvenience of having the ſtreet narrowed 14 feet, and the beauty of the whole entirely marred, it became much more liable to accidents by fire: but almoſt all theſe are now pulled down; and in doing this a ſingular taſte in the maſonry which ſupported them is ſaid to have been diſcovered.

9
Edinburgh deſtroyed by the Engliſh.

In 1542, a war with England having commenced through the treachery of Cardinal Beaton, an Engliſh fleet of 200 ſail entered the Forth; and having landed their forces, quickly made themſelves maſters of the towns of Leith and Edinburgh. They next attacked the caſtle, but were repulſed from it with loſs; and by this they were ſo enraged, that they not only deſtroyed the towns of Edinburgh and Leith, but laid waſte the country for a great way round.—Theſe towns, however, ſpeedily recovered from their ruinous ſtate; and, in 1547, Leith was again burned by the Engliſh after the battle of Pinkey, but Edinburgh was ſpared.

Several diſturbances happened in this capital at the time of the Reformation, of which an account is given under the article SCOTLAND; but none of theſe greatly affected the city till the year 1570, at which time there was a civil war on account of Q. Mary's forced reſignation. The regent, who was one of the contending parties, bought the caſtle from the perfidious governor (Balfour) for 5000 l. and the priory of Pittenweem. He did not, however, long enjoy the fruits of this infamous bargain. Sir William Kirkaldy, the new governor, a man of great integrity and bravery, declared for the Queen. The city in the mean time was ſometimes in the hands of one party and ſometimes of another; during which contentions, the inhabitants, as may eaſily be imagined, ſuffered extremely. In the year 1570 above mentioned, Queen Elizabeth ſent a body of 1000 foot and 300 horſe, under the command of Sir William Drury, to aſſiſt the king's party. The caſtle was ſummoned to ſurrender; and ſeveral ſkirmiſhes happened during the ſpace of two years, in which a kind of predatory war was carried on. At laſt a truce was agreed on till the month of January 1573; and this opportunity the Earl of Morton, now regent, made uſe of to build two bulwarks acroſs the high-ſtreet, nearly oppoſite to the tolbooth, to defend the city from the fire of the caſtle.

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On the firſt of January, early in the morning, the governor began to cannonade the city. Some of the cannon were pointed againſt the fiſh-market, then held on the high ſtreet; and the bullets falling among the fiſhes, ſcattered them about in a ſurpriſing manner, and even drove them up ſo high in the air, that they fell down upon the tops of the houſes. This unuſual ſpectacle having brought a number of people out of their houſes, ſome of them were killed and others dangerouſly wounded. Some little time afterwards, ſeveral houſes were ſet on fire by ſhot from the caſtle, and burned to the ground; which greatly enraged the people againſt the governor.—A treaty was at laſt concluded between the leaders of the oppoſite factions; but Kirkaldy refuſed to be comprehended in it. The regent therefore ſolicited the aſſiſtance of Queen Elizabeth, and Sir William Drury was again ſent into Scotland with 1500 foot and a train of artillery. The caſtle was now beſieged in form, and batteries raiſed againſt it in different places. The governor defended himſelf with great bravery for 33 days; but finding moſt of the fortifications demoliſhed, the well choaked up with rubbiſh, and all ſupplies of water cut off, he was obliged to ſurrender. The Engliſh general, in the name of his miſtreſs, promiſed him honourable treatment; but the Queen of England ſhamefully gave him up to the regent, by whom he was hanged.

Soon after this, the ſpirit of fanaticiſm, which ſomehow or other ſucceeded the Reformation, produced violent commotions, not only in Edinburgh, but thro' the whole kingdom. The foundation of theſe diſturbances, and indeed of moſt others which have ever happened in Chriſtendom on account of religion, was that pernicious maxim of Popery, that the church is independent of the ſtate. It is not to be ſuppoſed that this maxim was at all agreeable to the ſovereign; but ſuch was the attachment of the people to the doctrines of the clergy, that King James found himſelf obliged to compound matters with them. This, however, anſwered the purpoſe but very indifferently; and at laſt a violent uproar was excited. The King was then ſitting in the Court of Seſſion, which was held in the Tolbooth, when a petition was preſented to him by ſix perſons, lamenting the dangers which threatened religion; and being treated with very little reſpect by one Bruce a miniſter, his Majeſty aſked who they were that dared to convene againſt his proclamation? He was anſwered

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ed by Lord Lindſay, that they dared to do more, and would not ſuffer religion to be overthrown. On this the King perceiving a number of people crowding into the room, withdrew into another without making any reply, ordering the door to be ſhut. By this the petitioners were ſo much enraged, that on their return to the church the moſt furious reſolutions were taken; and had it not been for the activity of Sir Alexander Home the provoſt, and Mr Watt the deacon-convener who aſſembled the crafts in his Majeſty's behalf, it is more than probable that the door would have been forced, and an end put to his life. This affront was ſo much reſented by the King, that he thought proper to declare Edinburgh an unfit place of reſidence for the court or the adminiſtration of juſtice. In conſequence of this declaration, he commanded the college of juſtice, the inferior judges, and the nobility and barons, to retire from Edinburgh, and not to return without expreſs licence. This unexpected declaration threw the whole town into conſternation, and brought back the magiſtrates and principal inhabitants to a ſenſe of their duty. With the clergy it was far otherwiſe. They railed againſt the King in the moſt furious manner; and endeavouring to perſuade the people to take up arms, the magiſtrates were ordered to impriſon them: but they eſcaped by a timely flight. A deputation of the moſt reſpectable burgeſſes was then ſent to the King at Linlithgow, with a view to mitigate his reſentment. But he refuſed to be pacified; and on the laſt day of December 1596 entered the town between two rows of his ſoldiers who lined the ſtreets, while the citizens were commanded to keep within their houſes. A convention of the eſtates was held in the Tolbooth, before whom the magiſtrates made the moſt abject ſubmiſſions, but all in vain. The convention declared one of the late tumults, in which an attack had been made upon the King's perſon, to be high treaſon; and ordained, that if the magiſtrates did not find out the authors, the city itſelf ſhould be ſubjected to all the penalties due to that crime. It was even propoſed to raze the town to the foundation, and erect a pillar on the ſpot where it had ſtood, as a monument of its crimes. The inhabitants were now reduced to the utmoſt deſpair; but Queen Elizabeth interpoſing in behalf of the city, the King thought proper to abate ſomewhat of his rigour. A criminal proſecution, however, was commenced, and the town-council were commanded to appear at Perth by the firſt of February. On their petition, the time for their appearance was prolonged to the firſt of March; and the attendance of 13 of the common-council was declared ſufficient, provided they had a proper commiſſion from the reſt. The trial commenced on the fifth day of the month; and one of the number having failed in his attendance, the cauſe was immediately decided againſt the council: they were declared rebels, and their revenues forfeited.

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For 15 days the city continued in the utmoſt confuſion; but at laſt, on their earneſt ſupplication, and offering to ſubmit entirely to the King's mercy, the community were reſtored on the following conditions, which they had formerly proffered: That they ſhould continue to make a moſt diligent ſearch for the authors of the tumult, in order to bring them to condign puniſhment; that none of the ſeditious miniſters ſhould be allowed to return to their charges, and no others admitted without his Majeſty's conſent; and that in the election of their magiſtrates they ſhould preſent a liſt of the candidates to the King and his lords of council and ſeſſion, whom his Majeſty and their lordſhips might approve or reject at pleaſure. To theſe conditions the King now added ſome others; *viz.* that the houſes which had been poſſeſſed by the miniſters ſhould be delivered up to the King; and that the clergymen ſhould afterwards live diſperſed through the town, every one in his own pariſh: That the town-council houſe ſhould be appointed for accommodating the court of exchequer; and that the town ſhould become bound for the ſafety of the lords of ſeſſion from any attempts of the burgeſſes, under a penalty of 40,000 merks; and, laſtly, that the town ſhould immediately pay 20,000 merks to his Majeſty.

Edinburgh.

Upon theſe terms a reconciliation took place; which appears to have been very complete, as the King not only allowed the degraded miniſters to be replaced, but in 1610 conferred a mark of his favour on the town, by allowing the provoſt to have a ſword of ſtate carried before him, and the magiſtrates to wear gowns on public occaſions. In 1618 he paid his laſt viſit to this city, when he was received with the moſt extravagant pomp and magnificence. See Scotland.

13
Proceedings of the magiſtrates, &c.

The events which during this period, regard the internal police of the city, were principally the following. After the unfortunate battle at Pinkey, the magiſtrates, probably apprehending that now their power was enlarged by reaſon of the common calamity, proceeded in ſome reſpects in a very arbitrary manner; forcing the inhabitants to furniſh materials for the public works; enjoining merchants to bring home ſilver to be coined at the mint; and ordering lanterns to be hung out at proper places to burn till nine at night, &c. Another invaſion from England being apprehended in 1558, the city raiſed 1450 men for its defence, among whom there are ſaid to have been 200 tailors, ſo that their profeſſion ſeems to have been in a very flouriſhing ſtate at that time. During the diſturbances which happened at the reformation, and of which a particular account is given under the article Scotland, it was enacted, that the figure of St Giles ſhould be cut out of the town ſtandard, and that of a thiſtle inſerted in its place. It was likewiſe enacted, that none but thoſe who profeſſed the reformed religion ſhould ſerve in any office whatever; and the better to preſerve that extraordinary appearance of ſanctity which was affected, a pillar was erected in the North Loch, for the purpoſe of ducking fornicators.

In 1595, the boys of the High School roſe againſt their maſters; and ſuch was the barbariſm of thoſe days, that one of theſe ſtriplings ſhot a magiſtrate with a piſtol, who had come along with the reſt to reduce them to obedience. The reaſon of the uproar was, that they were in that year refuſed two vacations, which had been cuſtomary in former times: however, they were at laſt obliged to ſubmit, and ever ſince have been allowed only one for about ſix weeks in the autumn. The ſame year the houſe of one of the bailies was aſſaulted by the tradeſmens ſons, aſſiſted by journeymen who had not received the freedom of the town: he eſcaped with his life, but the offenders were baniſhed the city for ever.

14
Diſturbances in the time of Charles I.

In the beginning of the reign of Charles I. a perfect harmony ſeems to have ſubſiſted between the court and the city of Edinburgh; for in 1627 king Charles I. preſented the city with a new ſword and gown to be worn by the provoſt at the times appointed by his father James VI. Next year he paid a viſit to this capital, and was received by the magiſtrates in a moſt pompous manner; but ſoon after this the diſturbances aroſe which were not terminated but by the death of that unfortunate monarch. Theſe commenced on an attempt of Charles to introduce Epiſcopacy into the kingdom; and the firſt ſtep towards this was the erection of the three Lothians and part of Berwick into a dioceſe, Edinburgh being the epiſcopal ſeat, and the church of St Giles the cathedral. An account of the diſturbance occaſioned by the firſt attempt to read the prayer-book there, is given under the article Britain; but though the attempt was given over, the minds of the people were not to be quieted. Next winter they reſorted to town in ſuch multitudes, that the privy-council thought proper to publiſh two acts; by one of which the people were commanded, under ſevere penalties, to leave the town in 24 hours; and by the other, the court of ſeſſion was removed to Linlithgow. The populace and their leaders were ſo much enraged by the latter, that lord Traquair and ſome of the biſhops narrowly eſcaped with their lives; and next year (1638) matters became ſtill more ſerious. For now, the king having provoked his ſubjects throughout all Scotland with the innovations he attempted in religion, Edinburgh was made the general place of rendezvous, and the moſt formidable aſſociations took place; an account of which has already been given under the article Britain. Each of the towns in Scotland had a copy; and that which belonged to Edinburgh, crowded with 5000 names, is ſtill preſerved among the records of the city. Notwithſtanding this diſagreement, however, the king once more viſited Edinburgh in 1641, and was entertained by the magiſtrates at an expence of 12,000l. Scots. It does not appear that after this the city was in any way particularly concerned with the diſturbances which followed either throughout the remainder of the reign of Charles I. the commonwealth, or the reign of Charles II. In 1680 the duke of York with his ducheſs, the princeſs Anne, and the whole court of Scotland, were entertained by the city in the Parliament Houſe, at the expence of 15,000l. Scots. At this time it is ſaid that the ſcheme of building the bridge over the North Loch was firſt projected by the duke.

15
Regulations made by the magiſtrates.

From the time that king James VI. paid his laſt viſit to Edinburgh in 1618, till the time of the union in 1707, a conſiderable number of private regulations were made by the magiſtrates; ſome of them evidently calculated for the good of the city, others ſtrongly characteriſtic of that violent ſpirit of fanaticiſm which prevailed ſo much in the laſt century. Among the former was an act paſſed in 1621, that the houſes, inſtead of being covered with ſtraw or boards, ſhould have their roofs conſtructed of ſlate, tiles, or lead. This act was renewed in 1667; and in 1698 an act was paſſed regulating their height alſo. By this they were reſtrained to five ſtories, and the thickneſs of the wall determined to be three feet at bottom. In 1684 a lantern with a candle was ordered to be hung out in the firſt floor of every houſe in order to light the ſtreets at night; and there were two coaches with four horſes each ordered to be bought for the uſe of the magiſtrates; but it does not appear how long they continued to be uſed. In 1681 the court of ſeſſion diſcontinued its ſittings in ſummer: but as this was found to be attended with inconvenience, an act was paſſed for their reſtoration, which has continued ever ſince. During the time of the civil war in 1649, the city was viſited by the plague, which is the laſt time that dreadful diſtemper hath made its appearance in this country. The infection was ſo violent, that the city was almoſt depopulated, the priſoners were diſcharged from the tolbooth, and an act was made for giving one Dr Joannes Politius a ſalary of 80l. Scots per month, for viſiting thoſe who were infected with the diſeaſe. In 1677 the firſt coffee-houſes were allowed to be opened, but none without a licence: and the ſame year the town-council regulated the price of penny-weddings; ordaining the men to pay no more than two ſhillings, and the women 18 pence; very extravagant prices having been exacted before.

In contradiſtinction to theſe ſalutary acts, we may ſtate thoſe which ſhow an extravagant deſire of preſerving the appearance of virtue in the female ſex, as if it had been poſſible for others to inſpire them with virtuous notions if they had not imbibed them of themſelves. In 1633 an act of council was paſſed, by which women were forbidden to wear plaids over their faces, under penalty of five pounds and the forfeiture of the plaid for the firſt fault. Baniſhment was the puniſhment of the third. The reaſon aſſigned for this act was, that matrons were not known from ſtrumpets and looſe women, while the plaid continued to be worn over the face. This act was renewed in 1637 and 1638. Succeeding town-councils continued to ſhow the ſame regard to theſe matters; for in 1695 they enacted, that no inn-keeper, vintner, or ale-ſeller, ſhould for the future employ women as waiters or ſervants, under the penalty of five ſhillings ſterling for each.

The following anecdote may perhaps make the virtues of theſe legiſlators themſelves wear a ſuſpicious aſpect. In 1649 the city having borrowed L. 40,000 Scots, in order to raiſe their quota of men for his majeſty, the payment of it was abſolutely refuſed by the town-council when a demand was made for that purpoſe. That they might not, however, depend entirely upon their own opinion in a matter of ſuch importance, they took that of the General Aſſembly upon the ſubject; and it was determined by theſe reverend divines, that they were not in conſcience bound to pay for an unlawful engagement which their predeceſſors had entered into. But in 1652, Cromwell's parliament, who pretended to no leſs ſanctity than they, declared themſelves of a very different opinion; and on the application of one of the creditors, forced them to repay the ſum.

The treatment which the brave marquis of Montroſe met with, likewiſe fixes an indelible ſtigma both upon the magiſtrates and clergy at that time. Having been put under ſentence of excommunication, no perſon was allowed to ſpeak to him or do him the leaſt office of friendſhip. Being met without the city by the magiſtrates and town-guard, he was by them conducted in a kind of gloomy proceſſion through the ſtreets bare-

bareheaded, and in an elevated cart made for the purpoſe; the other priſoners walking two and two before him. At the time of his execution he was attended by one of the miniſters, who, according to his own account, did not chooſe to return till *he had ſeen him caſten over the ladder*.

The union in 1707 had almoſt produced a war between the two kingdoms which it was deſigned to unite; and on that occaſion Edinburgh became a ſcene of the moſt violent diſturbances, of which a particular account is given under the article Britain. During the time the act was paſſing, it was found abſolutely neceſſary for the guards and four regiments of foot to do duty in the city. The diſturbances were augmented by the diſagreement of the two members of parliament; and notwithſtanding the victory gained at that time by the court party, Sir Patrick Johnſton the provoſt, who voted for the union, was obliged afterwards to leave the country. In 1715 the city remained faithful to the royal cauſe, and proper meaſures were taken for its defence. A committee of ſafety was appointed, the city-guard increaſed, and 400 men raiſed at the expence of the town. The trained bands likewiſe were ordered out, 100 of whom mounted guard every night: by which precautions the rebels were prevented from attempting the city: they however made themſelves maſters of the citadel of Leith; but fearing an attack from the duke of Argyle, they abandoned it in the night-time. A ſcheme was even laid for becoming maſters of the caſtle of Edinburgh; for which purpoſe they bribed a ſerjeant to place their ſcaling ladders. Thus ſome of the rebels got up to the top of the walls before any alarm was given; but in the mean time the plot being diſcovered by the ſerjeant's wife, her huſband was hanged over the place where he had attempted to introduce the rebels. The expence of the armament which the city had been at on this occaſion amounted to about 1700l. which was repaid by government in the year 1721.

The loyalty of this city was ſtill farther remarkable in the year 1725, when diſturbances were excited in all parts of the kingdom, particularly in the city of Glaſgow, concerning the exciſe-bill; for all remained quiet in Edinburgh, notwithſtanding the violent outcries that were made elſewhere: and ſo remarkable was the tranquillity in the metropolis, that government afterwards returned thanks to the magiſtrates for it. In 1736, however, the city had again the misfortune to fall under the royal diſpleaſure, on the following account. Two ſmugglers having been detected in ſtealing their own goods out of a cuſtom-houſe, were condemned to be hanged. The crime was looked upon as trivial; and therefore a general murmur prevailed among the populace, which was no doubt heightened by the following accident. At that time it had been cuſtomary for perſons condemned to die to be carried each Sunday to the church, called from that circumſtance the *Tolbooth-church*. The two priſoners juſt mentioned were conducted in the uſual way, guarded by three ſoldiers, to prevent their making their eſcape: but having once gone thither a little before the congregation met, one of the priſoners ſeized one of the guards in each hand, and the other in his teeth, calling out to his companion to run; which he immediately did with ſuch ſpeed, that he ſoon got out of ſight, and was never heard of afterwards. The perſon who had thus procured the life of his companion without regard to his own, would no doubt become a general object of compaſſion; and of courſe, when led to the place of execution, the guard were ſeverely pelted by the mob, and ſome of them, according to the teſtimony of the witneſſes who were ſworn on the occaſion, pretty much wounded. By this Captain Porteous, who commanded the guard, was ſo much provoked, that he gave orders to fire, by which ſix people were killed and eleven wounded. The evidence, however, even of the fact that the orders to fire were given, appears not to have been altogether unexceptionable; nevertheleſs, on this he was tried and condemned to be executed. At that time the king was abſent at Hanover, having left the regency in the hands of the queen; and the caſe of the unfortunate Porteous having been repreſented to her, ſhe was pleaſed to grant him a reprieve: but ſuch was the inveteracy of the people againſt him, that they determined not to allow him to avail himſelf of the royal clemency. On the day that had been appointed for his execution, therefore, a number of people aſſembled, ſhut the gates of the city, and burnt the door of the priſon, the ſame which the mob would formerly have broke open in order to murder king James. They then took out Porteous, whom it was found impoſſible to reſcue out of their hands, though every method that the magiſtrates could take for that purpoſe in ſuch a confuſion was made uſe of. It was even proved, that the member of parliament went to the commander in chief, and requeſted that he would ſend a party of ſoldiers to quell the diſturbance, but was abſolutely denied this requeſt, becauſe he could not produce a written order from the provoſt to this purport; which, in the confuſion then exiſting in the city, could neither have been expected to be given by the provoſt, nor would it have been ſafe for any perſon to have carried it about him. Thus the unhappy victim was left in the hands of his executioners; and being dragged by them to the place deſtined for receiving his fate, was hanged on a dyer's ſign-poſt. As they had not brought a rope along with them, they broke open a ſhop where they knew they were to be had; and having taken out what they wanted, left the money upon the table, and retired without committing any other diſorder.

19
Government highly incenſed on that account.

Such an atrocious inſult on government could not but be highly reſented. A royal proclamation was iſſued, offering a pardon to any accomplice, and a reward of L. 200 to any perſon who would diſcover one of thoſe concerned. The proclamation was ordered to be read from every pulpit in Scotland the firſt Sunday of every month for a twelvemonth: but ſo divided were the people in their opinions about this matter, that many of the clergy heſitated exceedingly about complying with the royal order, by which they were brought in danger of being turned out of their livings; while thoſe who complied were rendered ſo unpopular, that their ſituation was rendered ſtill worſe than the others. All the efforts of government, however, were inſufficient to produce any diſcovery; by which, no doubt, the court were ſtill more exaſperated: and it was now determined to execute vengeance on the magiſtrates and city at large. Alexander Wilſon, the provoſt at that time, was impriſoned three weeks before he could be admitted to bail; after which, he and the four bailies, with the lords of juſticiary, were ordered to attend the houſe of peers at London. On their arrival there, a debate enſued, whether the lords ſhould attend in their robes or not? but at laſt it was agreed, that they ſhould attend in their robes at the bar. This, however, was refuſed by their lordſhips, who inſiſted that they ſhould be examined within the bar; upon which the affair of their examination was dropped altogether. A bill was at laſt paſſed both houſes, by which it was enacted, that the city of Edinburgh ſhould be fined in 2000 l. for the benefit of Porteous's widow (though ſhe was prevailed upon to accept of L. 1500 for the whole); and the provoſt was declared incapable of ever ſerving government again in any capacity whatever. To prevent ſuch cataſtrophes in time coming, the town-council enacted, that, on the firſt appearance of an inſurrection, the chief officers in the different ſocieties and corporations ſhould repair to the council, to receive the orders of the magiſtrates for the quelling of the tumult, under the penalty of 8l. 6 s. 8 d. for each omiſſion.

20
The city taken by the rebels in 1745.

In 1745, the city was inveſted by the Pretender's army; and on the 17th of September, the Netherbow-gate being opened to let a coach paſs, a party of Highlanders, who had reached the gate undiſcovered, ruſhed in, and took poſſeſſion of the city. The inhabitants were commanded to deliver up their arms at the palace of Holyroodhouſe: a certain quantity of military ſtores was required from the city, under pain of military execution; and an aſſeſſment of 2 s. 6 d. upon the pound was impoſed upon the *real* rents within the city and liberties, for defraying that expence.

The Pretender's army guarded all the avenues to the caſtle; but no ſigns of hoſtility enſued till the 25th of the month, when the garriſon being alarmed from ſome unknown cauſe, a number of cannon were diſcharged at the guard placed at the Weſt-port, but with very little effect. This gave occaſion to an order to the guard at the weigh-houſe, to prevent all intercourſe between the city and caſtle; and then the governor acquainted the provoſt by letter, that unleſs the communication was preſerved, he would be obliged to diſlodge the guard by means of artillery. A deputation was next ſent to the Pretender; acquainting him with the danger the city was in, and intreating him to withdraw the guard. With this he refuſed to comply; and the Highland centinels firing at ſome people who were carrying proviſions into the caſtle, a pretty ſmart cannonading enſued, which ſet on fire ſeveral houſes, killed ſome people, and did other damage. The Pretender then conſented to diſmiſs the guard, and the cannonading ceaſed. After the battle of Culloden, the provoſt of Edinburgh was obliged to ſtand a very long and ſevere trial, firſt at London and then at Edinburgh, for not defending the city againſt the rebels; which, from the ſituation and extent of the walls, every one muſt have ſeen to be impoſſible.

During this trial a very uncommon circumſtance happened; the jury having ſat two days, inſiſted that they could ſit no longer, and prayed for a ſhort reſpite. As the urgency of the caſe was apparent, and both parties agreed, the court, after long reaſoning, adjourned till the day following, taking the jury bound under a penalty of L. 500 each; when the court continued ſitting two days longer, and the jury were one day incloſed. The event was, that the provoſt was exculpated.

2
Gover ment city r red.

After the battle of Culloden the duke of Cumberland cauſed fourteen of the rebel ſtandards to be burned at the croſs: that of the pretender was carried by the common executioner, the others by chimney-ſweepers; the heralds proclaiming the name of the commanders to whom they belonged as they were thrown into the fire. At this time the city of Edinburgh felt a temporary inconvenience from the election of their magiſtrates not having taken place at the uſual time; ſo that it became neceſſary to apply to his majeſty for the reſtoration of the government of the city. This was readily granted, the burgeſſes being allowed a poll-tax; after which an entire new ſet of magiſtrates was returned, all of them friends to the houſe of Hanover; and ſoon after the freedom of the city in a gold box was preſented to the duke of Cumberland.

With theſe tranſactions all interferences betwixt government and the metropolis of Scotland were ended; the reſt of its hiſtory therefore only conſiſts of internal occurrences, the regulations made by its own magiſtrates for the benefit of the city, their applications to government for leave to improve it, or the execution of theſe improvements; of which we ſhall now give a brief detail.

2
Salar ſtowe the p

In the year 1716, the city firſt beſtowed a ſettled ſalary on the provoſt, in order to enable him to ſupport the dignity of firſt magiſtrate. This was at firſt L. 300; but has ſince been augmented to L. 500, which his lordſhip ſtill enjoys. In 1718 it was recommended to the magiſtrates to diſtinguiſh themſelves by wearing coats of black velvet, for which they were allowed L. 10; but this act being abrogated in 1754, gold chains were aſſigned as badges of their office, which they ſtill continue to wear. Provoſt Kincaid happened to die in office in the year 1777; which being a very rare accident, perhaps the only one of the kind to be met with in the records of Edinburgh, he was buried with great ſolemnity, and a vaſt concourſe of people attended.

2
Acco tum

Tumults have been frequent in Edinburgh, chiefly on account of the dearneſs of proviſions. In 1740 Bell's mills were firſt attacked by the populace, and afterwards Leith mills: nor could the rioters be diſperſed till the military had fired among them, and wounded three, of whom one died; and it was found neceſſary to order ſome dragoons into the city in order to preſerve tranquillity. In 1742 another violent tumult took place, owing to a cuſtom of ſtealing dead bodies from their graves for anatomical purpoſes, which had then become common. The populace beat to arms, threatened deſtruction to the ſurgeons: and in ſpite of all the efforts of the magiſtrates demoliſhed the houſe of the beadle at St Cuthbert's. In 1756, new diſturbances, which required the aſſiſtance of the military, took place: the cauſe at this time was the impreſſing of men for the war which was then commencing. A diſturbance was likewiſe excited in 1760. This was occaſioned by the footmen, who till then were allowed to follow their maſters into the playhouſe, and now took upon them to diſturb the entertainment of the company; the conſequence of which was, that they were turned out, and have ever ſince been obliged to wait for their maſters. In 1763 and 1765, the tumults on account of the price of proviſions were renewed; many of the meal-mongers had their urgh

their houſes broken open and their ſhops deſtroyed. The magiſtrates, as uſual, were obliged to call in a party of dragoons to quell the diſturbance; but at the ſame time, to put an effectual ſtop, as far as was in their power, to theſe proceedings for the future, they gave ſecurity, that people who brought grain or proviſion into the market ſhould be ſecured in their property. Since that time there have been no tumults directly on the account of proviſions; though in 1784 a terrible riot and attack of a diſtillery at Canonmills took place, on a ſuppoſition that the diſtillers enhanced the price of meal by uſing unmalted grain. The attack was repelled by the ſervants of the diſtillery; but the mob could not be quelled until the ſheriff called the ſoldiers quartered in the caſtle to his aſſiſtance. The ſame night a party of rioters ſet out for Ford, a place ten miles to the ſouthward, where there was likewiſe a large diſtillery; which, as there was none to make any oppoſition, they ſoon deſtroyed. One man was killed in this riot at Edinburgh by the fire of a ſervant of the diſtillery, and ſeveral of the rioters were afterwards ſecured and puniſhed.

In the years 1778 and 1779 two very alarming diſturbances happened, which threatened a great deal of bloodſhed, though happily they were terminated without any. The firſt was a mutiny of the earl of Seaforth's Highland regiment, who were at this time quartered in the caſtle. Theſe having been ordered to embark, for ſome reaſon or other unanimouſly refuſed, and poſted themſelves on the top of Arthur's ſeat, where they continued for two days. Troops were collected to prevent their eſcape, and the inhabitants were ordered to keep within doors at the firſt toll of the great bell, which was to be a ſignal of violence about to take place; but fortunately all the fears, naturally ariſing from the expectation of this event, were diſſipated by an accommodation. The other happened on account of the attempt to repeal the penal laws againſt the Papiſts; and was much more alarming than the other, as being the effect of a premeditated ſcheme and determined reſolution to oppoſe government. On the 2d of February 1779 a mob aſſembled in the evening, burned a Popiſh chapel, and plundered another. Next day they renewed their depredations; deſtroying and carrying off the books, furniture, &c. of ſeveral Popiſh prieſts and others of that perſuaſion. The riot continued all that day, though the aſſiſtance of the military was called in; but happily no lives were loſt, nor was there any firing. The city was afterwards obliged to make good the damage ſuſtained by the Catholics on this occaſion, which was eſtimated at L.1500. This year alſo an unlucky accident happened at Leith. About 50 Highland recruits having refuſed to embark, a party of the South Fencibles was ſent to take them priſoners. Unexpectedly, however, the Highlanders ſtood upon their defence; when, after ſome words, a firing commenced on both ſides, and about one half of the Highlanders were killed and wounded, the remainder being taken priſoners and carried to the caſtle. Captain Mansfield and two or three privates were killed in this affray.

We ſhall cloſe this hiſtory of Edinburgh with a general account of the improvements which have lately taken place in it, and of which a particular deſcription will afterwards be given. Theſe began in the year 1753, when the foundation-ſtone of the Exchange was laid, at which time there was a grand proceſſion, and the greateſt concourſe of people ever known in Edinburgh. A triumphal arch was erected for the purpoſe, through which the proceſſion paſſed, and medals were ſcattered among the populace. In 1756 the high ſtreet was cleared by the removal of the croſs; though many regretted this, on account of its being a very ancient and elegant building. In the middle it had an unicorn placed on the top of a pillar 20 feet high; but this fine ornament was broken to pieces by the giving way of the tackle by which it was attempted to remove it. It is now again erected at Drum, a ſeat belonging to lord Somerville, about four miles from Edinburgh. In 1763 the firſt ſtone of the north bridge was laid by provoſt Drummond; and in 1767 an act of parliament was obtained for extending the royalty of the city over the fields to the northward, where the New Town is now ſituated. About the ſame time a ſpot of ground upon the ſouth ſide of the town was purchaſed by a private perſon for L.1200, which being feued out for building, gave riſe to the increaſe of the town on that quarter; and this proceeded the more rapidly, as the houſes built there were free from the dues impoſed upon others ſubject to the royalty. In 1774 the foundation of the Regiſter-Office was laid. In 1784 the project for rendering the acceſs to the town equally eaſy on both ſides was begun to be put in execution by laying the foundation of the ſouth bridge. At the ſame time a great improvement was made by reducing the height of the ſtreet ſeveral feet all the way from the place where the croſs ſtood to the Netherbow; by which means the aſcent is rendered more eaſy, not only for carriages, but alſo for perſons who walk on foot. At the ſame time, the ſtreet was farther cleared by the removal of the town guard-houſe, which had long been complained of as an encumbrance. It is ſtill farther in contemplation to remove the Luckenbooths: and when this is accompliſhed, with other improvements by which it muſt neceſſarily be accompanied, it is to be queſtioned whether any city in Britain will be able to vie with Edinburgh in elegance and beauty.

Edinburgh.

Having thus given a conciſe hiſtory of the city from its earlieſt foundation, we ſhall now proceed to deſcribe it in its moſt improved ſtate.

25
Deſcription of Edinburgh.

Edinburgh is ſituated upon a ſteep hill, riſing from eaſt to weſt, and terminating in a high and inacceſſible rock, upon which the caſtle ſtands. At the eaſt end or lower extremity of this hill ſtands the abbey of Holyrood-houſe, or king's palace, diſtant from the caſtle upwards of a mile; and betwixt which, along the top of the ridge, and almoſt in a ſtraight line, runs the high-ſtreet. On each ſide, and parallel to this ridge or hill, is another ridge of ground lower than that in the middle, and which does not extend ſo far to the eaſt; that on the ſouth being intercepted by Saliſbury-rocks and Arthur's-ſeat, a hill of about 800 feet of perpendicular height; and that on the north by the Calton-hill, conſiderably lower than Arthur's-ſeat: ſo that the ſituation of this city is moſt ſingular and romantic; the eaſt or lower part of the town lying between two hills; and the weſt or higher part riſing up towards

towards a third hill, little inferior in height to the higheſt of the other two, upon which, as has been obſerved, the caſtle is built, and overlooks the town.

The buildings of the town terminate at the diſtance of about 200 yards from the caſtle-gate; which ſpace affords a moſt delightful as well as convenient and healthful walk to the inhabitants. The proſpect from this ſpot is perhaps the fineſt any where to be met with, for extent, beauty, and variety.

In the valley or hollow betwixt the mid and the ſouth ridges, and nearly parallel to the high-ſtreet, is another ſtreet called the Cowgate; and the town has now extended itſelf over moſt part of that ſouth ridge alſo. Betwixt the mid and the north ridges was a loch, which, till of very late, terminated the town on that ſide. From the high-ſtreet towards the loch on the north, and Cowgate on the ſouth, run narrow croſs ſtreets or lanes, called *wynds* and *cloſes*, which grow ſteeper and ſteeper the farther weſt or nearer the caſtle; ſo that, were it not for the cloſeneſs and great height of the buildings, this city, from its ſituation and plan, might naturally be expected to be the beſt aired, as well as the cleaneſt, in Europe. The former, notwithſtanding theſe diſadvantages, it enjoys in an eminent degree; but we cannot compliment it upon the latter, notwithſtanding every poſſible means has been uſed by the magiſtrates for that purpoſe.

The ſteepneſs of the aſcent makes the acceſs to the high-ſtreet from the north and ſouth very difficult; which no doubt greatly retarded the enlargement of the city. To remedy this inconvenience on the north, and with a view to extend the town on that quarter, a moſt elegant bridge has been thrown over the north loch, which joins the north ridge to the middle of the high-ſtreet, by ſo eaſy an aſcent as one in ſixteen; and in purſuance of the deſign, a plan of a new town to the north was fixed upon, and is now nearly finiſhed, with an elegance and taſte that does honour to this country. In like manner, to facilitate the acceſs from the ſouth ſide, a bridge has been thrown over the valley through which the Cowgate runs; which, if not equally elegant with the north bridge, is certainly as convenient.

26
Account of the gradual increaſe of Edinburgh

The gradual increaſe of the city of Edinburgh may in ſome degree be underſtood from the traces of its ancient walls that ſtill remain. James II. in 1450, firſt beſtowed on the community the privilege of fortifying the city with a wall, and empowered them to levy a tax upon the inhabitants for defraying the expence. When the city was firſt fortified, the wall reached no further than the preſent water-houſe, or reſervoir, on the caſtle-hill: from thence to the foot of Halkerſton's wynd, juſt below the new-bridge, the city was defended by the north-loch; an inconſiderable moraſs, which, being formerly overflowed, formed a ſmall lake that hath ſince been drained. From this place to the foot of Leith-wynd, it does not appear how the city was fortified: but from the foot of Leith-wynd to the Nether-bow-port it was defended only by a range of houſes; and when theſe had become ruinous, a wall was built in their place. The original wall of Edinburgh, therefore, began at the foot of the north-eaſt rock of the caſtle. Here it was ſtrengthened by a ſmall fortreſs, the ruins of which are ſtill to be ſeen, and are called the *well-houſe tower*, from their having a ſpring in their neighbourhood. When the wall came oppoſite to the reſervoir, it was carried quite acroſs the hill, having a gate on the top for making a communication between the town and caſtle. In going down the hill, it went ſlanting in an oblique direction to the firſt angle in going down the Weſt-bow, where was a gate named the *Upper-bow port*, one of the hooks of which ſtill remains. Thence it proceeded eaſtward in ſuch a manner, as would have cut off not only all the Cowgate, but ſome part of the parliament-houſe; and being continued as far as the mint-cloſe, it turned to the north-eaſt, and connected itſelf with the buildings on the north ſide of the high-ſtreet, where was the original *Nether-bow Port*, about 50 yards weſt from that which afterwards went by the ſame name.

Soon after the building of this wall, a new ſtreet was formed on the outſide of it, named the *Cowgate*, which in the 16th century became the reſidence of the nobility, the ſenators of the college of juſtice, and other perſons of the firſt diſtinction. After the fatal battle of Flowden, however, the inhabitants of the Cowgate became very anxious to have themſelves defended by a wall as well as the reſt. The wall of the city was therefore extended to its preſent limits. This new wall begins on the ſouth-eaſt ſide of the rock on which the caſtle is built, and to which the town-wall comes quite cloſe. From thence it deſcends obliquely to the Weſt-port; then aſcends part of a hill on the other ſide, called the *High Riggs;* after which, it runs eaſtward with but little alteration in its courſe, to the Briſto and Potter-row ports, and from thence to the Pleaſance. Here it takes a northerly direction, which it keeps from thence to the Cowgate-port; after which the incloſure is completed to the Netherbow by the houſes of St Mary's wynd. The original Netherbow port being found not well adapted for defence was pulled down, and a new one built in 1571 by the adherents of queen Mary. In 1606, the late handſome building was erected about 50 yards below the place where the former ſtood. It was two ſtories high, and had an elegant ſpire in the middle; but being thought to encumber the ſtreet, and the whole building being in a crazy ſituation, it was pulled down by order of the magiſtrates in 1764.

In the original wall of Edinburgh there was, as has been already obſerved, a port on the caſtle-hill. On the extenſion of the wall, after building the houſes in the Cowgate, this gate was pulled down. That in the upper or weſt bow ſtood for a much longer time, and was pulled down within the memory of ſome perſons lately or perhaps ſtill living. Beſides theſe, there was a third, about 50 yards above the head of the Canongate; but whether there were any more, is uncertain. The ports or gates of the new walls were, 1. The *Weſt-port*, ſituated at the extremity of the Graſs-market; beyond which lies a ſuburb of the town and a borough of regality, called *Portſburgh*. Next to this is a wicket, ſtruck out of the town-wall in 1744, for the purpoſe of making an eaſier communication between the town and the public walks in the meadows, than by Briſto-port. The next to this was *Briſto-port*, built in 1515; beyond which lies a ſuburb called *Briſto-ſtreet*. At a ſmall diſtance from Briſto was the *Potter-row Port*, which took this name from a manufactory of earthen ware in the neighbourhood. Formerly it was called *Kirk of*

*Field*

*Field Port.* Between this and the Cowgate-port ſtood another, called *St Mary's Wynd Port*, which extended from eaſt to weſt acroſs the foot of the Pleaſance, and which was demoliſhed only ſince the middle of the laſt century.—Cloſe to the middle of this ſtood the *Cowgate-port;* which opened a communication between the Cowgate and St Mary's wynd, and the Pleaſance.—The *Nether-bow Port* has been already ſpoken of.—At the foot of Leith-wynd was another gate, known by the name of *Leith-wynd Port*; and within it was a wicket giving acceſs to the church of Trinity College, and which ſtill remains. At the foot of Halkerſton's wynd was another, which, as well as the former, was built about the year 1560. Both of theſe were pulled down ſome years ago, and all the reſt in 1785.—Another ſtill remains at the foot of the Canongate, known by the name of the *Water-gate*.

For 250 years the city of Edinburgh occupied the ſame ſpace of ground, and it is but very lately that its limits have been ſo conſiderably enlarged. In the middle of the 16th century, it is deſcribed as extending in length about an Italian mile, and about half as much in breadth; which anſwers very nearly to its preſent limits, the late enlargements only excepted.—This ſpace of ground, however, was not at that time occupied in the manner it is at preſent. The houſes were neither ſo high nor ſo crowded upon each other as they are now. This was a conſequence of the number of inhabitants increaſing, which has occaſioned the raiſing of the houſes to ſuch an height as is perhaps not to be paralleled in any other part of the world. Till the time of the Reformation, the burying ground of the city extended over all the ſpace occupied by the Parliament-ſquare, and from thence to the Cowgate. The lands lying to the ſouthward of the Cowgate were chiefly laid out in gardens belonging to the convent of Black-friars, and the church of St Mary in the Field. Theſe extended almoſt from the Pleaſance to the Potterrow-port. From the Briſto to the Weſt-Port, the ground was laid out in gardens belonging to the Gray-friars. The magiſtrates, on their application to queen Mary, obtained a grant of the Gray-friars gardens for a burying-place; for which it was given as a reaſon, that they were ſomewhat diſtant from the town. Here, however, it muſt be underſtood, that theſe gardens were diſtant from the houſes, and not without the walls; for they had been incloſed by them long before.—In the time of James I. the houſes within the walls ſeem to have been in general, if not univerſally, covered with thatch or broom; and not above 20 feet high. Even in the year 1621, theſe roofs were ſo common, that they were prohibited by act of parliament, in order to prevents accident from fire.—In the middle of the laſt century, there were neither courts nor ſquares in Edinburgh. The Parliament cloſe or ſquare is the oldeſt of this kind in the city. Miln's ſquare, James's court, &c. were built long after; and Argyle's and Brown's ſquares within theſe 50 years.

The *New Town* was projected in the year 1752; but as the magiſtrates could not then procure an extenſion of the royalty, the execution of the deſign was ſuſpended for ſome time. In 1767, an act was obtained, by which the royalty was extended over the fields to the northward of the city; upon which advertiſements were publiſhed by the magiſtrates, deſiring proper plans to be given in. Plans were given in accordingly, and that deſigned by Mr James Craig architect was adopted. Immediately afterwards, people were invited to purchaſe lots from the town-council; and ſuch as purchaſed became bound to conform to the rules of the plan. In the mean time, however, the town-council had ſecretly reſerved to themſelves a privilege of departing from their own plan; which they afterwards made uſe of in ſuch a manner as produced a law-ſuit. According to the plan held forth to the purchaſers, a canal was to be made through that place where the north-loch had been, and the bank on the north ſide of it laid out in terraces: but inſtead of this, by an act of council, liberty was reſerved to the town to build upon this ſpot; and therefore, when many gentlemen had built genteel houſes in the new town on faith of the plan, they were ſurpriſed to find the ſpot appointed for terraces and a canal, beginning to be covered with mean irregular buildings, and work-houſes for tradeſmen. This deviation was immediately complained of; but as the magiſtrates ſhowed no inclination to grant any redreſs, a proſecution was commenced againſt them before the Lords of Seſſion. In that court the cauſe was given againſt the purſuers, who thereupon appealed to the Houſe of Lords. Here the ſentence of the Court of Seſſion was reverſed, and the cauſe remitted to the conſideration of their Lordſhips. At laſt, after an expenſive conteſt, matters were accommodated. The principal term of accommodation was, that ſome part of the ground was to be laid out in terraces and a canal; but the time of diſpoſing it in that manner, was referred to the Lord Preſident of the Court of Seſſion and the Lord Chief Baron of the Exchequer.—The fall of part of the bridge, hereafter mentioned, proved a very conſiderable diſadvantage to the new town; as it neceſſarily induced a ſuſpicion that the paſſage, by means of the bridge, could never be rendered ſafe. An overſight of the magiſtrates proved of more eſſential detriment. A piece of ground lay to the ſouthward of the old town, in a ſituation very proper for building. This the magiſtrates had an opportunity of purchaſing for 1200l; which, however, they neglected, and it was bought by a private perſon, who immediately feued it out in lots for building, as has been already mentioned. The magiſtrates then began to ſee the conſequence, namely, that this ſpot being free from the duties to which the royalty of Edinburgh is ſubject, people would chooſe to reſide there rather than in the New Town. Upon this they offered the purchaſer 2000l. for the ground for which he had paid 1200l.; but as he demanded 20,000l. the bargain did not take place. Notwithſtanding theſe diſcouragements, the New Town is now almoſt finiſhed; and from the advantages of its ſituation, and its being built according to a regular plan, it hath undoubtedly a ſuperiority over any city in Britain. By its ſituation, however, it is remarkably expoſed to ſtorms of wind, which, at Edinburgh, ſometimes rage with uncommon violence.

It has three ſtreets, almoſt a mile in length, running from eaſt to weſt, interſected with croſs ſtreets at proper diſtances. The moſt northerly, called *Queen's Street*, is 100 feet broad, and commands an extenſive proſpect of the Forth, the county of Fife, and the ſhipping in the river. That called *George's Street*, which is in the middle, is no leſs than 1·5 feet wide. It is terminated at each end by two very elegant and extenſive ſquares; that on the eaſt end is called *St Andrew's Square*; the other, tho' not yet finiſhed, nor indeed begun, is to be named *Charlotte's Square*. Prince's ſtreet is the moſt ſoutherly; and extends from the northern extremity of the bridge, quite to the weſt end of the town; though as that is not yet finiſhed, we cannot ſay whether it will be done exactly according to the plan laid down, as there has been a propoſal made by a private perſon of continuing the whole a conſiderable way farther to the weſtward, to end in a circus. The reaſon given for this propoſed innovation is, that the road to Glaſgow and other parts in the weſt will thus be rendered more eaſy, as it will then lie along the new bridge over the Water of Leith at Bell's mills, which is much more convenient than that juſt now in uſe.

The moſt remarkable public buildings in Edinburgh are:

28 Public buildings deſcribed.

1. *The Caſtle.* This ſtands on a high rock, acceſſible only on the eaſt ſide. On all others it is very ſteep, and in ſome places perpendicular. It is about 300 feet high from its baſe: ſo that, before the invention of artillery, it might well have been deemed impregnable; though the event ſhowed that it was not.—The entry to this fortreſs is defended by an outer barrier of palliſadoes; within this is a dry ditch, draw-bridge, and gate, defended by two batteries which flank it; and the whole is commanded by an half-moon mounted with braſs cannon, carrying balls of 12 pounds. Beyond theſe are two gate-ways, the firſt of which is very ſtrong, and has two portculliſes. Immediately beyond the ſecond gate-way, on the right hand, is a battery mounted with braſs cannon, carrying balls of 12 and 18 pounds weight. On the north ſide are a mortar and ſome gun batteries.—The upper part of the caſtle contains a half-moon battery, a chapel, a parade for exerciſe, and a number of houſes in the form of a ſquare, which are laid out in baracks for the officers. Beſides theſe there are other baracks ſufficient to contain 1000 men; a powder magazine bomb-proof; a grand arſenal, capable of containing 8000 ſtand of arms; and other apartments for the ſame uſe, which can contain 22,000 more: ſo that 30,000 ſtand of arms may be conveniently lodged in this caſtle.—On the eaſt ſide of the ſquare above mentioned, were formerly royal apartments; in one of which king James VI. was born, and which is ſtill ſhown to thoſe who viſit the caſtle. In another, the regalia of Scotland were depoſited on the 26th of March 1707, and are ſaid to be ſtill kept there; but they are never ſhown to any body. Hence a ſuſpicion has ariſen that they have been carried to London; which is the more confirmed, as the keeper of the jewel-office in the tower of London ſhows a crown, which he calls that of Scotland; and it is certain that the door of what is called the *Crown-room* has not been publicly known to be opened ſince the union.

The governor of the caſtle is generally a nobleman, whoſe place is worth about 1000l. a-year; and that of deputy-governor, 500l. This laſt reſides in the houſe appointed for the governor, as the latter never inhabits it. There is alſo a fort-major, a ſtore-keeper, maſter gunner, and chaplain; but as this laſt does not reſide in the caſtle, worſhip is ſeldom performed in the chapel. The parliament-houſe was formerly included in the great ſquare on the top, and the royal gardens were in the marſh afterwards called the *North-loch*; the king's ſtables being on the ſouth ſide, where the houſes ſtill retain the name, and the place where the barns were ſtill retain the name of Caſtle-barns.

The caſtle is defended by a company of invalids, and four or five hundred men belonging to ſome marching regiment, though it can accommodate 1000, as above-mentioned; and this number has been ſometimes kept in it. Its natural ſtrength of ſituation was not ſufficient to render it impregnable, even before the invention of artillery, as we have already obſerved; much leſs would it be capable of ſecuring it againſt the attacks of a modern army well provided with cannon. It could not, in all probability, withſtand, even for a few hours, a well directed bombardment: for no part but the powder-magazine is capable of reſiſting theſe deſtructive machines; and the ſplinters from the rock on which the caſtle is built, could not fail to render them ſtill more formidable. Beſides, the water of the well, which is very bad, and drawn up from a depth of 100 feet, is apt to ſubſide on the continued diſcharge of artillery, which produces a concuſſion in the rock.

2. *The Palace of Holyrood-houſe.* This, though much neglected, is the only royal habitation in Scotland that is not entirely in ruins. It is a handſome ſquare of 230 feet in the inſide, ſurrounded with piazzas. The front, facing the weſt, conſiſts of two double towers joined by a beautiful low building, adorned with a double baluſtrade above. The gateway in the middle is decorated with double ſtone columns, ſupporting a cupola in the middle, repreſenting an imperial crown, with a clock underneath. On the right hand is the great ſtaircaſe which leads to the council chamber and the royal apartments. Theſe are large and ſpacious, but unfurniſhed: in one of them the Scotch peers meet to elect 16 of their number to repreſent them in parliament. The gallery is on the left hand, and meaſures 150 feet by 27½. It is adorned with the ſuppoſed portraits of all the kings of Scotland. In the apartments of the duke of Hamilton, which he poſſeſſes as hereditary keeper of the palace, queen Mary's bed of crimſon damaſk, bordered with green fringes and taſſels, is ſtill to be ſeen, but almoſt reduced to rags. Here alſo ſtrangers are ſhown a piece of wainſcot hung upon hinges, which opens to a trap-ſtair communicating with the apartments below. Through this paſſage Darnley and the other conſpirators ruſhed in to murder the unhappy Rizzio. Towards the outward door of theſe apartments are large duſky ſpots on the floor, ſaid to be occaſioned by Rizzio's blood, which could never be waſhed out. In the lodgings aſſigned to lord Dunmore is a picture by Van Dyke, eſteemed a maſterly performance, of king Charles I. and his queen going a-hunting. There are likewiſe the portraits of their preſent majeſties at full length by Ramſay. The lodgings above the royal apartments are occupied by the duke of Argyle as heritable maſter of the houſehold.

The front of this palace is two ſtories high; the roof

roof flat; but at each end the front projects, and is ornamented with circular towers at the angles. Here the building is much higher, and the reſt of the palace is three ſtories in height. The north-weſt towers were built by James V. for his own reſidence: his name is ſtill to be ſeen below a nitch in one of theſe towers. During the minority of queen Mary, this palace was burned by the Engliſh; but ſoon after repaired and enlarged beyond its preſent ſize. At that time it conſiſted of five courts, the moſt weſterly of which was the largeſt. It was bounded on the eaſt by the front of the palace, which occupied the ſame ſpace it does at preſent; but the building itſelf extended further to the ſouth. At the north-weſt corner was a ſtrong gate, with Gothic pillars, arches, and towers, part of which was not long ago pulled down. Great part of the palace was burnt by Cromwell's ſoldiers; but it was repaired and altered into the preſent form after the Reſtoration. The fabric was planned by Sir William Bruce a celebrated architect, and executed by Robert Mylne maſon. The environs of the palace afford an aſylum for inſolvent debtors; and adjoining to it is an extenſive park, all of which is a ſanctuary.

The abbey church was formerly called the *monaſtery of Holyrood-houſe*, and built by king David I. in 1128. He gave it the name of *Holyrood-houſe*, in memory, as is ſaid, of his deliverance from an enraged hart, by the miraculous interpoſition of a croſs from heaven. This monaſtery he gave to the canons regular of St Auguſtine: on whom he alſo beſtowed the church of Edinburgh caſtle, with thoſe of St Cuthbert's, Corſtorphin, and Libberton, in the ſhire of Mid-Lothian, and of Airth in Stirlingſhire; the priories of St Mary's iſle in Galloway, of Blantyre in Clydeſdale, of Rowadill in Roſs, and three others in the Weſtern Iſles. To them he alſo granted the privilege of erecting a borough between the town of Edinburgh and the church of Holyrood-houſe. From theſe canons it had the name of the *Canongate*, which it ſtill retains. In this new borough they had a right to hold markets. They had alſo portions of land in different parts, with a moſt extenſive juriſdiction, and right of trial by duel, and fire and water ordeal. They had alſo certain revenues payable out of the exchequer and other funds, with fiſhings, and the privilege of erecting mills on the water of Leith, which ſtill retain the name of *Canon-mills*. Other grants and privileges were beſtowed by ſucceeding ſovereigns; ſo that it was deemed the richeſt religious foundation in Scotland. At the Reformation, its annual revenues were, 442 bolls of wheat, 640 bolls of bear, 560 bolls of oats, 500 capons, two dozen of hens, as many ſalmon, 12 loads of ſalt; beſides a great number of ſwine, and about 250 l. ſterling in money. At the Reformation, the ſuperiority of North Leith, part of the Pleaſance, the barony of Broughton, and the Canongate, was veſted in the earl of Roxburgh; and were purchaſed from him by the town-council of Edinburgh in 1636. In 1544, the church ſuffered conſiderably by the invaſion of the Engliſh; but was ſpeedily repaired. At the Reſtoration, king Charles II. ordered the church to be ſet apart as a chapel-royal, and prohibited its uſe as a common pariſh church for the future. It was then fitted up in a very elegant manner. A throne was erected for the ſovereign, and 12 ſtalls for the knights of the order of the thiſtle: but as maſs had been celebrated in it in the reign of James VII. and it had an organ, with a ſpire, and a fine chime of bells on the weſt ſide, the Preſbyterians at the revolution entirely deſtroyed its ornaments, and left nothing but the bare walls.—Through time, the roof of the church became ruinous; on which the duke of Hamilton repreſented its condition to the barons of exchequer, and craved that it might be repaired. This requeſt was complied with: but the architect and maſon who were employed, covered the roof with thick flag-ſtones, which ſoon impaired the fabric; and on the 2d of December 1768, the roof fell in. Since that time, no attempt has been made to repair it, and it is now entirely fallen to ruin.

The ruins of this church, however, are ſtill ſufficient to diſcover the excellency of the workmanſhip. Here ſome of the king's of Scotland are interred; and an odd kind of curioſity has been the occaſion of expoſing ſome bones ſaid to be thoſe of lord Darnley and a counteſs of Roxburgh who died ſeveral hundred years ago. Thoſe ſaid to belong to the former were very large, and the latter had ſome fleſh dried upon them. The chapel was fitted up in the elegant manner above mentioned by James VII. but ſuch was the enthuſiaſm of the mob, that they not only deſtroyed the ornaments, but tore up even the pavement, which was of marble.

To the eaſtward of the palace is the bowling-green, now entirely in diſorder; and behind it is a field called *St Ann's Yards*. Beyond this is a piece of ground called *the King's Park*; which undoubtedly was formerly overgrown with wood, though now there is not a ſingle tree in it. It is about three miles in circumference; and was firſt incloſed by James V. It contains the rocky hills of *ARTHUR's Seat* and Saliſbury Craigs, which laſt afford an inexhauſtible ſtone quarry; and upon the north ſide of the hill ſtands an old ruinous chapel, dedicated to St Anthony. The ſtones are uſed in building, as well as for paving the ſtreets and high-ways. The park was mortgaged to the family of Haddington for a debt due to them; and by the preſent earl has been divided into a number of incloſures by ſtone-dykes raiſed at a conſiderable expence. A good number of ſheep and ſome black cattle are fed upon it; and it is now rented at 1500 l. annually.

3. *St Giles's Church* is a beautiful Gothic building, meaſuring in length 206 feet. At the weſt end, its breadth is 110; in the middle, 129; and at the eaſt end, 76 feet. It has a very elevated ſituation, and is adorned with a lofty ſquare tower; from the ſides and corners of which riſe arches of figured ſtone-work: theſe meeting with each other in the middle, complete the figure of an imperial crown, the top of which terminates in a pointed ſpire. The whole height of this tower is 161 feet.

This is the moſt ancient church in Edinburgh. From a paſſage in an old author called *Simeon Dunelmenſis*, ſome conjecture it to have been built before the year 854; but we do not find expreſs mention made of it before 1359. The tutelar ſaint of this church, and of Edinburgh, was St Giles, a native of Greece. He lived in the ſixth century, and was deſcended of an illuſtrious family. On the death of his parents, he

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gave all his eſtate to the poor; and travelled into France, where he retired into a wilderneſs near the conflux of the Rhone with the ſea, and continued there three years. Having obtained the reputation of extraordinary ſanctity, various miracles were attributed to him; and he founded a monaſtery in Languedoc, known long after by the name of *St Giles's.*—In the reign of James II. Mr Preſton of Gorton, a gentleman whoſe deſcendents ſtill poſſeſs an eſtate in the county of Edinburgh, got poſſeſſion of the arm of this ſaint; which relic he bequeathed to the church of Edinburgh. In gratitude for this donation, the magiſtrates granted a charter in favour of Mr Preſton's heirs, by which the neareſt heir of the name of Preſton was entitled to carry it in all proceſſions. At the ſame time, the magiſtrates obliged themſelves to found an altar in the church of St Giles's, and appoint a chaplain for celebrating an annual maſs for the ſoul of Mr Preſton; and likewiſe, that a tablet, containing his arms, and an account of his pious donation, ſhould be put up in the chapel.—St Giles's was firſt ſimply a pariſh-church, of which the biſhop of Lindisfarn or Holy Iſland, in the county of Northumberland, was patron. He was ſucceeded in the patronage by the abbot and canons of Dunfermline, and they by the magiſtrates of Edinburgh. In 1466, it was erected into a collegiate church by James III.—At the Reformation, the church was, for the greater convenience, divided into ſeveral parts. The four principal ones are appropriated to divine worſhip, the leſſer ones to other purpoſes. At the ſame time the religious utenſils belonging to this church were ſeized by the magiſtrates. They were,—St Giles's arm, enſhrined in ſilver, weighing five pounds three ounces and an half; a ſilver chalice, or communion-cup, weighing 23 ounces; the great *euchariſt* or communion-cup, with *golden weike and ſtanes;* two cruets of 25 ounces; a golden bell, with a heart, of four ounces and a half; a golden unicorn; a golden pix, to keep the hoſt; a ſmall golden heart, with two pearls; a diamond ring: a ſilver chalice, patine, and ſpoon, of 32 ounces and a half: a communion-table-cloth of gold brocade; *St Giles's coat*, with a little piece of red velvet which hung at his feet; a round ſilver *euchariſt:* two ſilver cenſers, of three pounds fifteen ounces; a ſilver ſhip for incenſe; a large ſilver croſs, with its baſe, weighing ſixteen pounds thirteen ounces and a half; a triangular ſilver lamp; two ſilver candleſticks, of ſeven pounds three ounces; other two, of eight pounds thirteen ounces; a ſilver chalice gilt, of 20½ ounces; a ſilver chalice and croſs, of 75 ounces; beſides the prieſts robes, and other veſtments, of gold brocade, crimſon velvet embroidered with gold, and green damaſk.—Theſe were all ſold, and part of the money applied to the repairs of the church; the reſt was added to the funds of the corporation.

In the ſteeple of St Giles's church are three large bells brought from Holland in 1621; the biggeſt weighing 2000 lb. the ſecond 700, and the third 500. There are alſo a ſet of muſic bells, which play every day between one and two o'clock, or at any time in the caſe of rejoicings. The principal diviſion is called the *High Church*, and has been lately repaired and new ſeated. There is a very elegant and finely ornamented ſeat for his majeſty, with a canopy ſupported by four Corinthian pillars decorated in high taſte. This ſeat is uſed by the king's commiſſioner during the time the General Aſſembly ſits. On the right hand is a ſeat for the lord high conſtable of Scotland, whoſe office it is to keep the peace within doors in his majeſty's preſence; it being the duty of the earl marſhal to do the ſame without. The ſeats belonging to the lords of council and ſeſſion are on the right of the lord high conſtable; and on the left of the throne was a ſeat for the lord high chancellor of Scotland; but that office being now aboliſhed, the ſeat is occupied by others. On the left of this ſit the barons of exchequer; and, to the left of them, the lord provoſt, magiſtrates, and town-council. The pulpit, king's ſeat, and galleries, are covered with crimſon velvet with gold and ſilk fringes.

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The aiſle of St Giles's church is fitted up with ſeats for the general aſſembly who meet here; and there is a throne for his majeſty's commiſſioner with a canopy of crimſon ſilk damaſk, having the king's arms embroidered with gold, preſented by the late lord Cathcart to his ſucceſſor in office. In this church is a monument dedicated to the memory of lord Napier, baron of Merchiſton, well known as the inventor of logarithms; a ſecond to the earl of Murray, regent of Scotland during the minority of James VI.; and a third to the great marquis of Montroſe.

4. *The Parliament Houſe*, in the great hall of which the Scottiſh parliament uſed to aſſemble, is a magnificent building. The hall is 123 feet long and 42 broad, with a fine arched roof of oak, painted and gilded. In this the lawyers and agents now attend the courts, and ſingle judges ſit to determine cauſes in the firſt inſtance, or to prepare them for the whole court, who ſit in an inner room formerly appropriated to the privy-council. In a nich of the wall is placed a fine marble ſtatue of preſident Forbes, erected at the expence of the faculty of advocates. There are alſo full length portraits of king William III. queen Mary his conſort, and queen Anne, all done by Sir Godfrey Kneller; alſo of George I. John duke of Argyle, and Archibald duke of Argyle, by Mr Aikman of Cairney.

Above ſtairs are the court of exchequer and treaſury chamber, with the different offices belonging to that department; and below is one of the moſt valuable libraries in Great Britain, belonging to the faculty of advocates. Beſides 30,000 printed volumes, there are many ſcarce and valuable manuſcripts, medals, and coins: here is alſo an entire mummy in its original cheſt, preſented to the faculty (at the expence of 300 l.) by the earl of Morton, late preſident of the royal ſociety. As theſe rooms are immediately below the hall where the parliament ſat, they are ſubject to a ſearch by the lord high conſtable of Scotland ever ſince the gun-powder plot: and this is ſpecified in the gift from the city to the faculty. This library was founded, in the year 1682, by Sir George Mackenzie lord advocate. Among other privileges, it is intitled to a copy of every book entered in ſtationer's hall. Before the great door is a noble equeſtrian ſtatue of Ch. II. the proportions of which are reckoned exceedingly juſt. Over the entrance are the arms of Scotland, with Mercy and Truth on each ſide for ſupporters.

The court of ſeſſion, the ſupreme tribunal in Scotland, conſiſts of 15 judges, who ſit on a circular bench, clothed in purple robes turned up with crimſon velvet. Six of theſe are lords of the juſticiary, and go the circuit

cuit twice a-year; but, in that capacity, they wear ſcarlet robes turned up with white ſattin.

5. *The Tolbooth* was erected in 1561, not for the purpoſes merely of a priſon, but likewiſe for the accommodation of the parliament and other courts; but it has ſince become ſo very unfit for any of theſe purpoſes, that it is now propoſed to pull it down and rebuild it in ſome other place, eſpecially as it is very inconvenient in its preſent ſituation on account of its incumbering the ſtreet. The provoſt is captain of the tolbooth, with a gaoler under him: and the latter has a monopoly of all the proviſions for the priſoners; a circumſtance which muſt certainly be conſidered as a grievous oppreſſion, thoſe who are leaſt able to purchaſe them being thus obliged to do ſo at the higheſt price. There is a chaplain who has a ſalary of 30l. a-year.

6. There is a Hall in the Writers Court belonging to the clerks to his majeſty's ſignet, where there is alſo an office for the buſineſs of the ſignet. The office of keeper of the ſignet is very lucrative, and he is allowed a depute and clerks under him. Before any one enters into this ſociety he muſt attend the college for two years, and ſerve five years as an apprentice to one of the ſociety. There is a good library belonging to this hall, which is rapidly increaſing, as every one who enters muſt pay 10 l. towards it. He pays alſo 100 l. of apprentice-fee, and 100l. when he enters.

7. *The Exchange* is a large and elegant building, with a court of about 90 feet ſquare in the middle. On the north ſide are piazzas where people can walk under cover, the other three ſides being laid out in ſhops; but the merchants have never made uſe of it to meet in, ſtill ſtanding in the ſtreet as formerly. The back part of the building is uſed for the general cuſtomhouſe of Scotland, where the commiſſioners meet to tranſact buſineſs. They have above 20 offices for the different departments, to which the acceſs is by a hanging ſtair 60 feet in height. In looking over the window before he aſcends this ſtair, a ſtranger is ſurpriſed to find himſelf already 40 feet from the ground, which is owing to the declivity on which the exchange is built. For the cuſtomhouſe rooms the city receives a rent of 1l. *per* day.

The Truſtees Office for the improvement of fiſheries and manufactures in Scotland is in the ſouth-weſt corner of the exchange; the fund under their management being part of the equivalent money given to Scotland at the Union. This is diſtributed in premiums amongſt thoſe who appear to have made any conſiderable improvement in the arts.

7. *The North Bridge*, which forms the main paſſage of communication betwixt the Old and New Towns, was founded, as has already been obſerved, in 1763 by Provoſt Drummond; but the contract for building it was not ſigned till Auguſt 21ſt 1765. The architect was Mr William Mylne, who agreed with the town-council of Edinburgh to finiſh the work for 10,140 l. and to uphold it for 10 years. It was alſo to be finiſhed before Martinmas 1769: but on the 3d of Auguſt that year, when the work was nearly completed, the vaults and ſide-walls on the ſouth fell down, and five people were buried in the ruins. This misfortune was occaſioned by the foundation having been laid, not upon the ſolid earth, but upon the rubbiſh of the houſes which had long before been built on the north ſide of the high-ſtreet, and which had been thrown out into the hollow to the northward. Of this rubbiſh there were no leſs than eight feet between the foundation of the bridge and the ſolid earth. Beſides this deficiency in the foundation, an immenſe load of earth which had been laid over the vaults and arches in order to raiſe the bridge to a proper level, had no doubt contributed to produce the cataſtrophe above mentioned.—The bridge was repaired, by pulling down ſome parts of the ſide-walls, and afterwards rebuilding them; ſtrengthening them in others with chain-bars; removing the quantity of earth laid upon the vaults, and ſupplying its place with hollow arches, &c. The whole was ſupported at the ſouth end by very ſtrong buttreſſes and counterforts on each ſide; but on the north it has only a ſingle ſupport.—The whole length of the bridge, from the High-ſtreet in the Old Town to Prince's-ſtreet in the New, is 1125 feet; the total length of the piers and arches is 310 feet. The width of the three great arches is 72 feet each; of the piers, 13½ feet; and of the ſmall arches, each 20 feet. The height of the great arches, from the top of the parapet to the baſe, is 68 feet; the breadth of the bridge within the wall over the arches is 40 feet, and the breadth at each end 50 feet.—On the ſouthern extremity of this bridge ſtands the General Poſt Office for Scotland; a neat plain building, with a proper number of apartments for the buſineſs, and a houſe for the ſecretary.

The communication betwixt the two towns by means of this bridge, though very complete and convenient for ſuch as lived in certain parts of either, was yet found inſufficient for thoſe who inhabited the weſtern diſtricts. Another bridge being therefore neceſſary, it was propoſed to fill up the valley occaſionally with the rubbiſh dug out in making the foundations of houſes in the New Town; and ſo great was the quantity, that this was accompliſhed ſo as to be fit for the paſſage of carriages in little more than four years and an half.

8. *The South Bridge* is directly oppoſite to the other, ſo as to make but one ſtreet, croſſing that called the *High-ſtreet* almoſt at right angles. It conſiſts of 19 arches of different ſizes: but only one of them is viſible, *viz.* the large one over the Cowgate; and even this is ſmall in compariſon with thoſe of the North Bridge, being no more than 30 feet wide and 31 feet high. On the ſouth it terminates at the Univerſity on one hand, and the Royal Infirmary on the other. The Tron Church, properly called *Chriſt Church*, ſtands at the northern extremity, facing the High-ſtreet, and in the middle of what is now called *Hunter's Square*, in memory of the late worthy chief magiſtrate who planned theſe improvements, but did not live to ſee them executed. On the weſt ſide of this ſquare the Merchant Company have built a very handſome hall for the occaſional meetings of their members. This bridge was erected with a deſign to give an eaſy acceſs to the great number of ſtreets and ſquares on the ſouth ſide, as well as to the country on that quarter from whence the city is ſupplied with coals. The ſtreet on the top is ſuppoſed to be as regular as any in Europe; every houſe being of the ſame dimenſions, excepting that between every two of the ordinary conſtruction there is one with a pediment on the top, in order to prevent

that faſtneſs of appearance which would otherwiſe take place. So great was the rage for purchaſing ground on each ſide of this bridge for building, that the areas ſold by public auction at 50l. *per* foot in front. By this the community will undoubtedly be conſiderable gainers; and the proprietors hope to indemnify themſelves for their extraordinary expence by the vaſt ſale of goods ſuppoſed to attend the ſhops in that part of the town; though this ſeems ſomewhat more dubious than the former.

9. *The Concert Hall*, called alſo *St Cecilia's Hall*, ſtands in Niddery's-ſtreet; and was built in 1762, after the model of the great opera-theatre in Parma. The plan was drawn by Sir Robert Mylne, architect of Blackfriars bridge. The muſical room is of an oval form, the ceiling being a concave elliptical dome, lighted from the top by a lanthorn. The ſeats are ranged in the form of an amphitheatre; and are capable of containing 500 perſons, beſides leaving a large area in the middle of the room. The orcheſtra is at the upper end, and is terminated by an elegant organ.

The muſical ſociety was firſt inſtituted in the year 1728. Before that time, ſeveral gentlemen had formed a weekly club at a tavern kept by one Steil, a great lover of muſic, and a good ſinger of Scots ſongs. Here the common enertainment conſiſted in playing on the harpſichord and violin the concertos and ſonatas of Handel, juſt then publiſhed. The meeting, however, ſoon becoming numerous, they inſtituted, in the year above mentioned, a ſociety of 70 members, for the purpoſe of holding a weekly concert. The affairs of the ſociety are regulated by a governor, deputy-governor, treaſurer, and five directors, who are annually choſen by the members. The meetings have been continued ever ſince that time on much the ſame footing as at firſt, and the number of members is now increaſed to 200. The weekly concerts are on Friday; the tickets being given gratis by the directors, and attention paid in the firſt place to ſtrangers. Oratorios are occaſionally performed throughout the year; and the principal performers have alſo benefit concerts. The band are excellent in their ſeveral departments; and ſeveral of the members are alſo good performers, and take their part in the orcheſtra. There are always many applications on the occaſion of a vacancy by the death of any of the members or otherwiſe; and ſuch is generally the number of candidates, that it is no eaſy matter to get in.

10. *The Univerſity*. In the year 1581, a grant was obtained from king James VI. for founding a college or univerſity within the city of Edinburgh; and the citizens, aided by various donations from well diſpoſed perſons, purchaſed a ſituation for the intended new college, conſiſting of part of the areas, chambers, and church of the collegiate provoſtry and prebends of the Kirk-a-field, otherwiſe called *Templum et Præfectura Sanctæ Mariæ in campis*, lying on the ſouth ſide of the city. Next year, a charter of confirmation and erection was obtained alſo from king James VI. from which the college to be built did afterwards derive all the privileges of an univerſity.

In 1583, the provoſt, magiſtrates, and council, the patrons of this new inſtitution, prepared the place in the beſt manner they could for the reception of teachers and ſtudents; and in the month of October the ſame year, Robert Rollock, whom they had invited from a profeſſorſhip in St Salvator's College in the univerſity of St Andrew's, began to teach in the new college of Edinburgh. Other profeſſors were ſoon after elected; and in the year 1586, Rollock was appointed principal of the college, and the following year alſo profeſſor of divinity, immediately after he had conferred the degree of M. A. on the ſtudents who had been under his tuition for four years. The offices of principal and profeſſor of divinity remained united till the year 1620.

In the 1617, king James VI. having viſited Scotland after his acceſſion to the crown of England, commanded the principal and regents of the college of Edinburgh to attend him in Stirling caſtle; and after they had there held a ſolemn philoſophical diſputation in the royal preſence, his majeſty was ſo much ſatisfied with their appearance, that he deſired their college for the future might be called *The College of King James*, which name it ſtill bears in all its diplomas or public deeds.

For ſeveral years the college conſiſted only of a principal, who was alſo profeſſor of divinity, with four regents or profeſſors of philoſophy. Each of theſe regents inſtructed one claſs of ſtudents for four years, in Latin, Greek, ſchool logic, mathematics, ethics, and phyſics, and graduated them at the concluſion of the fourth courſe. A profeſſor of humanity or Latin was afterwards appointed, who prepared the ſtudents for entering under the tuition of the regents; alſo a profeſſor of mathematics, and a profeſſor of Hebrew or Oriental languages. It was not till about the year 1710 that the four regents began to be confined each to a particular profeſſion; ſince which time they have been commonly ſtyled *Profeſſors of Greek, Logic, Moral, Philoſophy, and Natural Philoſophy*.—The firſt medical profeſſors inſtituted at Edinburgh, were Sir Robert Sibbald and Doctor Archibald Pitcairn, in the year 1685[*]. Theſe, however, were only titular profeſſors; and for 30 years afterwards, a ſummer-lecture on the officinal plants, and the diſſection of a human body once in two or three years, completed the whole courſe of medical education at Edinburgh.—In 1720, an attempt was made to teach the different branches of phyſic regularly; which ſucceeded ſo well, that, ever ſince, the reputation of the univerſity as a ſchool for medicine hath been conſtantly increaſing, both in the iſland of Britain, and even among diſtant nations.

The college is endowed with a very fine library, founded in 1580 by Mr Clement Little advocate, who bequeathed it to the town-council. They ordered a houſe to be built for it in the neighbourhood of St Giles's church, where it was for ſome time kept under the care of the eldeſt miniſter of Edinburgh, but was afterwards removed to the college. This collection is enriched, as well as others of a ſimilar kind, by receiving a copy of every book entered in Stationer's hall, according to the ſtatute for the encouragement of authors. Beſides this, the only fund it has is the money paid by all the ſtudents at the univerſity, except thoſe of divinity, upon their being matriculated; and a ſum of 5l. given by each profeſſor at his admiſſion. The amount of theſe ſums is uncertain, but has been eſtimated at about 150l. annually. The ſtudents of

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[*] See LEGE *Phyſi*

of divinity, who pay nothing to this library, have one belonging to their own particular department.

Here are ſhown two ſkulls, one almoſt as thin as paper, pretended to be that of the celebrated George Buchanan, and, by way of contraſt, another ſaid to have been that of an idiot, and which is exceſſively thick. Here alſo are preſerved the original proteſt againſt the council of Conſtance for burning John Huſs and Jerom of Prague in 1417; the original contract of queen Mary with the dauphin of France, and ſome valuable coins and medals. There are alſo ſeveral portraits; particularly of Robert Pollock the firſt principal of the univerſity, king James VI. Lord Napier the inventor of logarithms, John Knox, principal Carſtairs, Mr Thomſon the author of the Seaſons, &c. The muſeum contains a good collection of natural curioſities, the number of which is daily increaſing. The anatomical preparations are worth notice, as are alſo thoſe belonging to the profeſſor of midwifery.

The celebrity of this college has been greatly owing to the uniform attention of the magiſtracy in filling up the vacant chairs with men of known abilities in their reſpective departments. Greatly to their honour, too, they have been no leſs attentive to the inſtituting of new profeſſorſhips from time to time as the public ſeemed to demand them. At preſent (anno 1790), the Senatus Academicus conſiſts of the following members, arranged according to the different faculties.

### *Faculty of* THEOLOGY.

William Robertſon, D. D. Principal of the College.
Andrew Hunter, D. D. Profeſſor of Divinity.
Thomas Hardy, D. D. Regius Profeſſor of Church-Hiſtory.
James Robertſon, D. D. Profeſſor of Oriental Languages, and Emeritus Secretary and Librarian.

### *Faculty of* LAW.

Robert Dick, Advocate, Profeſſor of Civil Law.
Allan Maconochie, Advocate, Profeſſor of Public Law.
Alexander Fraſer Tytler, Advocate, Profeſſor of Univerſal Civil Hiſtory, and of Greek and Roman Antiquities.
David Hume, Advocate, Profeſſor of Scots Law.

### *Faculty of* MEDICINE.

Alexander Monro, M. D. Profeſſor of Medicine, and of Anatomy and Surgery.
James Gregory, M. D. Profeſſor of the Practice of Phyſic.
Joſeph Black, M. D. Profeſſor of Medicine and Chemiſtry.
Francis Home, M. D. Profeſſor of Medicine and Materia Medica.
Andrew Duncan, M. D. Profeſſor of the Theory of Phyſic.
Daniel Rutherford, M. D. Profeſſor of Medicine and Botany.
Alexander Hamilton, M. D. Profeſſor of Midwifery.

### *Faculty of* ARTS.

George Stewart, LL. D. Emeritus Profeſſor of Humanity.
Adam Ferguſſon, LL. D. Emeritus Profeſſor of Moral Philoſophy, and joint Profeſſor of Mathematics.
Hugh Blair, D. D. Emeritus Profeſſor of Rhetoric and Belles Lettres.
Andrew Dalziel, A. M. Profeſſor of Greek, and Secretary and Librarian.
John Robiſon, A. M. Profeſſor of Natural Philoſophy.
Dugald Stewart, A. M. Profeſſor of Moral Philoſophy.
John Hill, LL. D. Profeſſor of Humanity.
John Bruce, A. M. Joint Profeſſor of Logic.
John Walker, D. D. Regius Profeſſor of Natural Hiſtory, and Keeper of the Muſeum.
William Greenfield, A. M. Profeſſor of Rhetoric and Belles Lettres.
John Playfair, A. M. Profeſſor of Mathematics.
Robert Blair, M. D. Regius Profeſſor of Practical Aſtronomy.
James Finlayſon, A. M. Joint Profeſſor of Logic.
Andrew Coventry, M. D. Profeſſor of Agriculture.
Andrew Fife, Principal Janitor and Macer.
William Stewart, under Janitor.

*N. B.* There are only about 50 burſers in this univerſity, and theſe do not exceed 12l. *per annum*.

The number of ſtudents during the laſt ſeſſion of the college, from October 10. 1789 to May 6. 1790, was nearly as follows:

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| Students of Divinity | 130 |
| ———— Law | 100 |
| ———— Phyſic | 440 |
| General Claſſes | 420 |
| In all | 1090 |

The old buildings being very mean, and unfit for the reception of ſo many profeſſors and ſtudents, and quite unſuitable to the dignity of ſuch a flouriſhing univerſity, as well as inconſiſtent with the improved ſtate of the city, the Lord Provoſt, Magiſtrates, and Council, ſet on foot a ſubſcription for erecting a new ſtructure, according to a deſign of Robert Adam, Eſq; architect. Part of the old fabric has in conſequence been pulled down, and the new building is already in conſiderable forwardneſs. The foundation ſtone was laid on Monday the 16th of November, with great ſolemnity, by the Right Hon. Francis Lord Napier, grand maſter maſon of Scotland, in the preſence of the Right Hon. the Lord Provoſt, Magiſtrates, and Town-Council of the city of Edinburgh, with the Principal, Profeſſors, and Students of the univerſity of Edinburgh, a number of Nobility and Gentry, and the Maſters, Officers, and Brethren, of all the lodges of free maſons in the city and neighbourhood, who marched in proceſſion from the Parliament-Houſe down the High-Street. After the different maſonic ceremonials were performed, two cryſtal-bottles, caſt on purpoſe at the glaſs-houſe of Leith, were depoſited in the foundation-ſtone. In one of theſe were put different coins of the preſent reign, each of them being previouſly enveloped in cryſtal, in ſuch an ingenious manner, that the legend on the coins could be diſtinctly read without breaking the cryſtal. In the other bottle were depoſited ſeven rolls of vellum, containing a ſhort account of the original foundation and preſent ſtate of the univerſity, together with ſeveral other papers, in particular the different newſpapers, containing advertiſements relative to the college, &c. and a liſt of the names of the Principal and Profeſſors, alſo of the preſent Lord Provoſt and Magiſtrates, and Officers of the grand lodge of Scotland. The bottles being carefully ſealed up, were covered with a plate of copper wrapt in block tin; and upon the under ſide of the copper were engraved the arms of the city of Edinburgh and the univerſity; likewiſe the arms of the Right Hon. Lord Napier, grand maſter maſon of Scotland. Upon the upper ſide, a Latin inſcription, of which the following is a copy:

ANNUENTE DEO OPT. MAX.
REGNANTE GEORGIO III. PRINCIPE
MUNIFICENTISSIMO;
ACADEMIÆ EDINBURGENSIS
ÆDIBUS,
INITIO QUIDEM HUMILLIMIS,
ET JAM, POST DUO SECULA, PENE RUINOSIS;
NOVI HUJUS ÆDIFICII,
UBI COMMODITATI SIMUL ET ELEGANTIÆ,
TANTO DOCTRINARUM DOMICILIO
DIGNÆ,
CONSULERETUR,
PRIMUM LAPIDEM POSUIT,
PLAUDENTE INGENTI OMNIUM ORDINUM
FREQUENTIA,
VIR NOBILISSIMUS
FRANCISCUS DOMINUS NAPIER,
REIPUB. ARCHITECTONICÆ APUD SCOTOS
CURIO MAXIMUS:
XVI. KAL. DECEMB.
ANNO SALUTIS HUMANÆ MDCCLXXXIX.
ÆRÆ ARCHITECTONICÆ IↃↃIↃCCLXXXIX.
CONSULE THOMA ELDER,
ACADEMIÆ PRÆFECTO GULIELMO
ROBERTSON,
ARCHITECTO ROBERTO ADAM.
Q. F. F. Q. S.

The eaſt and weſt fronts of this pile are to extend 255 feet, and the ſouth and north 358. There are to be houſes for the principal and ſix or ſeven of the profeſſors. The library is to be a room of 160 feet in length; the muſeum for natural curioſities is to be of the ſame extent; and the dimenſions of the hall for degrees and public exerciſes are about 90 feet by 30. There are likewiſe to be an elegant and moſt convenient anatomical theatre; a chemical laboratory; and large rooms for inſtruments and experiments for the profeſſors of mathematics, natural philoſophy, and agriculture. The whole when finiſhed, if not the moſt ſplendid ſtructure of the ſort in Europe, will however be the completeſt and moſt commodious; and it will do the utmoſt honour to the genius of the architect and to the munificence of the public. About L. 16,000 is already ſubſcribed; and there is no doubt that the aid of parliament will be granted to complete the work.

The botanical garden belonging to the univerſity is ſituated at the diſtance of about a mile, on the road between Edinburgh and Leith. It conſiſts of about five acres of ground; and is furniſhed with a great variety of plants, many of them brought from the moſt diſtant quarters of the globe. The profeſſor is botaniſt to the king, and receives a ſalary of 120l. annually for the ſupport of the garden. A monument, to the memory of the celebrated botaniſt Linnæus, was erected here by the late Dr Hope, who firſt planned the garden, and brought it to perfection.

The univerſity of Edinburgh, like the others in this kingdom, ſends one member to the General Aſſembly of the church of Scotland; and the widows of the profeſſors have a right to the funds of thoſe of miniſters, the profeſſors being truſtees on that fund along with the preſbytery of Edinburgh.

11. *The Royal Infirmary* was firſt thought of by the college of phyſicians in 1725. A fiſhing company happening to be diſſolved at that time, the partners contributed ſome of their ſtock towards the eſtabliſhment of the infirmary. A ſubſcription was alſo ſet on foot, and application made to the General Aſſembly to recommend the ſame throughout their juriſdiction. This was readily complied with, and the aſſembly paſſed an act for that purpoſe; but very little regard was paid to it by the clergy. Notwithſtanding this, however, 2000l. being procured, a ſmall houſe was opened for the reception of the ſick poor in Auguſt 1729. In 1736, the contributors towards the infirmary were erected into a body corporate by royal ſtatute; and after this the contributions increaſed very conſiderably: by which means the managers were enabled to enlarge their ſcheme from time to time; and at laſt to undertake the preſent magnificent ſtructure, the foundation of which was laid in 1738. During 25 years, when this inſtitution was in its infancy, Lord Hopetoun beſtowed upon it an annuity of 400l. In 1750, Doctor Archibald Ker bequeathed to this incorporation 200l. a-year in the iſland of Jamaica. In 1755, the lords of the treaſury made a donation to it of 8000l. which had been appointed for the ſupport of invalids. In return for this, the managers of the infirmary conſtantly keep 60 beds in readineſs for the reception of ſick ſoldiers. This year alſo ſick ſervants began to be admitted into the infirmary, and a ward was fitted up for their reception.

This inſtitution, however, was more indebted to George Drummond, Eſq; than to any other perſon. He was ſeven times choſen lord provoſt of Edinburgh; and always directed his attention to the improvement of the city, particularly to that of the royal infirmary. So ſenſible were the managers of their obligations to him, that, in their hall, they erected a buſt of him with this inſcription, "George Drummond, to whom this country is indebted for all the benefit which it derives from the Royal Infirmary."—In 1748, the ſtock of the infirmary amounted to 5000l; in 1755, to 7076l. beſides the eſtate left by Doctor Ker; in 1764, to 23,426l.; and in 1778, to 27,074l.

The royal infirmary is attended by two phyſicians choſen by the managers, who viſit their patients daily in preſence of the ſtudents. All the members of the college of ſurgeons are alſo obliged to attend in rotation, according to ſeniority. If any ſurgeon declines attendance, he is not allowed to appoint a depute; but the patients are committed to the care of one of four aſſiſtant ſurgeons, choſen annually by the managers.—From the year 1762 to 1769, there were admitted 6261 patients; which number added to 109 who were in the hoſpital at the commencement of the year 1762, made, in all, 6370. Of theſe, 4395 were cured; 358 died; the reſt were either relieved, diſmiſſed incurable, for irregularities, or by their own deſire, or remained in the hoſpital. - From 1770 to 1775, the patients annually admitted into the infirmary were, at an average, 1567; of whom 63 died. In 1776, there were admitted 1668, of whom 57 died; and in 1777, the number admitted was 1593, and of deaths 52. In the year 1786, there were admitted 1822 patients: Of theſe 1354 were cured; 166 relieved; 84 died; the reſt were either relieved, diſmiſſed incurable, for irregularities, or by their own deſire.

The building conſiſts of a body and two wings, each of them three ſtories high, with an attic ſtory and garrets, and a very elegant front. The body is 210 feet long, and 36 broad in the middle, but at the ends only 24 feet broad. There is a buſt of king George II. in a Roman dreſs, above the great door. The wings are 70 feet long, and 24 broad. In the centre is a large ſtair-caſe, ſo wide that ſedan chairs may be carried up. In the different wards, 228 patients may be accommodated, each in a different bed. There are cold and hot baths for the patients, and alſo for the citizens; and to theſe laſt the patients are never admitted.

Beſides the apartments neceſſary for the ſick, there are others for the officers and ſervants belonging to the houſe. There are likewiſe rooms for the managers, a conſulting room for the phyſicians and ſurgeons, a waiting-room for the ſtudents, and a theatre that will hold upwards of 200 people for performing chirurgical operations. There is a military ward, ſupported by the intereſt of the 8000l. already mentioned; and in conſequence of which a ſmall guard is always kept at the infirmary. The wards for ſick ſervants are ſupported by collections at the church doors. Beſides the attendance of the royal college of ſurgeons by rotation, as has already been mentioned, there are two phyſicians belonging to the houſe, who are elected by the managers, and have a ſmall ſalary; there is likewiſe a houſe-ſurgeon and apothecary. Students who attend the infirmary pay 3l. 3s. annually, which brings in a revenue of about 500l. towards defraying the expence of the houſe. Two wards are ſet apart for the patients whoſe caſes are ſuppoſed to be moſt intereſting; and the phyſicians give lectures upon them.

12. *The Public Diſpenſary* was founded by Dr Duncan in 1776, for the poor whoſe diſeaſes are of ſuch a nature as to render their admiſſion into the infirmary either unneceſſary or improper. Here the patients receive advice gratis four days in the week; a regiſter is kept of the diſeaſes of each, and of the effects produced by the medicines employed. All patients not improper for diſpenſary treatment are admitted on the recommendation of the elder or church-warden of the pariſh where they reſide. The phyſicians officiate and give lectures gratis; ſo that the apothecary who lodges in the houſe, and the medicines, are the only expences attending this uſeful inſtitution. The expence of the whole is defrayed by public contributions, and from a ſmall annual fee paid by the ſtudents who attend the lectures. It is under the direction of a preſident, two vice-preſidents, and 20 directors, elected annually from among the contributors. One guinea intitles a contributor to recommend patients and be a governor for two years, and five guineas gives the ſame privilege for life.

13. *The High School.* The earlieſt inſtitution of a grammar-ſchool in Edinburgh ſeems to have been about the year 1519. The whole expence beſtowed upon the firſt building of this kind amounted only to about 40l. Sterling. Another building, which had been erected for the accommodation of the ſcholars in 1578, continued, notwithſtanding the great increaſe of their number, to be uſed for that purpoſe till 1777. The foundation of the preſent new building was laid on the 24th of June that year by Sir William Forbes, Grand Maſter of the Free Maſons. The total length of this building is 120 feet from ſouth to north; the breadth in the middle 36, at each end 38 feet. The great hall where the boys meet for prayers, is 68 feet by 30. At each end of the hall is a room of 32 feet by 20, intended for libraries. The building is two ſtories high, the one 18, the other 17, feet in height. The expence of the whole when finiſhed is reckoned at 4000l.

There is a rector and four maſters, who teach from 4 to 500 ſcholars annually. The ſalaries are trifling, and the fees depend upon the reputation they have obtained for teaching; and as this has been for ſome years very conſiderable, the rector's place is ſuppoſed to be worth not leſs than 400l. *per annum*, a maſter's about half that ſum. There is a janitor, whoſe place is ſuppoſed to be worth about 70l. a-year. His buſineſs is to take care of the boys on the play-ground; and there is a woman who lives on the ſpot as under janitor, whoſe place may be worth about 25 l. annually. There is a library, but not large, as each of the boys pays only one ſhilling annually to its ſupport.

There are four eſtabliſhed Engliſh ſchools in Edinburgh; the maſters of which receive a ſmall ſalary, upon expreſs condition that they ſhall not take above five ſhillings per quarter from any of their ſcholars. There are likewiſe many other private ſchools in Edinburgh for all languages; and, in general, every kind of education is to be had here in great perfection and at a very cheap rate.

14. *The Mint* is kept up by the articles of union, with all the offices belonging to it, though no money is ever ſtruck here. It ſtands in the Cowgate, a little to the weſt of the Engliſh church; but is in a ruinous ſtate, though ſtill inhabited by the different officers, who have free houſes; and the bell-man enjoys his ſalary by regularly ringing the bell. This place, as well as the abbey of Holyrood-houſe, is an aſylum for debtors.

15. *The Engliſh Chapel* ſtands near the Cowgate port, and was founded on the 3d of April 1771. The foundation-ſtone was laid by general Oughton, with the following inſcription: *Edifici ſacr. Eccleſiæ epiſc. Angliæ, primum poſuit lapidem J. Adolphus Oughton, in architectonicæ Scotiæ repub. curio maximus, militum præfectus, regnante Georgio III. tertio Apr. die, A. D.* MDCCLXXI. It is a plain handſome building, neatly fitted up in the inſide, and ſomewhat reſembling the church of St Martin's in the Fields, London. It is 90 feet long, 75 broad, and ornamented with an elegant ſpire of conſiderable height. It is alſo furniſhed with an excellent bell, formerly belonging to the chapel royal at Holyrood-houſe, which is permitted to be rung for aſſembling the congregation; an indulgence not granted to the Preſbyterians in England. The expence of the building was defrayed by voluntary ſubſcription;

and, to the honour of the country, people of all perſuaſions contributed to this pious work. It has already coſt 7000l. and will require 1000l. more to finiſh the portico. This church is built in a ſingular manner, viz. from ſouth to north, and the altar-piece ſtands on the eaſt ſide. Three clergymen officiate here, of whom the firſt has 150l. the other two 100l. each. The altar-piece is finely decorated, and there is a good organ.

There is another Epiſcopal chapel, but ſmall, in Black-fryars wynd, which was founded by Baron Smith in the year 1722. There are alſo ſome meetings of the Epiſcopal church of Scotland, who adhere to their old forms, having ſtill their biſhops and inferior clergy. For ſome time theſe were ſubjected to penal laws, as they refuſed to take the oath to government, or mention the preſent royal family in their public prayers: but of late they have conformed, and had their conduct approved of by his Majeſty; ſo that now every denomination of Chriſtians in Britain pray for the royal family on the throne.

16. *Heriot's Hoſpital* owes its foundation to George Heriot, goldſmith to James VI. who acquired by his buſineſs a large fortune. At his death, he left the magiſtrates of Edinburgh 23,625l. 10s. "for the maintenance, relief, and bringing up of ſo many poor and fatherleſs boys, freemens ſons of the town of Edinburgh," as the above ſum ſhould be ſufficient for. This hoſpital is finely ſituated on the weſt end of the ſouth ridge, almoſt oppoſite to the caſtle, and is the moſt magnificent building of the kind in Edinburgh. It was founded in July 1628, according to a plan (as is reported) of Inigo Jones; but the work being interrupted by the civil wars, it was not finiſhed till the year 1650. The expence of the building is ſaid to have been upwards of 30,000l (A): and the hoſpital is now poſſeſſed of an income of about 3000l. a-year; though this cannot be abſolutely aſcertained, as the rents are paid in grain, and of courſe muſt be fluctuating.

It ſtands on a riſing ground to the ſouth-weſt of the city, and is a ſquare of 162 feet without, having a court 94 feet ſquare in the inſide, with piazzas on three of the ſides. There is a ſpire with a clock over the gateway, and each corner of the building is ornamented with turrets; but notwithſtanding the magnificent appearance of the outſide, the inner part is far from being convenient. There is a ſtatue of the founder over the gateway, in the dreſs of the times, and a very good painting of him in the governor's room, with a picture of the late treaſurer Mr Carmichael. There is a chapel 61 feet long and 22 broad, which is now repairing in ſuch a manner as will make it worthy of notice. When Cromwell took poſſeſſion of Edinburgh after the battle of Dunbar, he quartered his ſick and wounded ſoldiers in this hoſpital. It was applied to the ſame purpoſe till the year 1658, when general Monk, at the requeſt of the governors, removed the ſoldiers; and on the 11th of April 1659, it was opened for the reception of boys, 30 of whom were admitted into it. The Auguſt after, they were increaſed to 40; and in 1661, to 52. In 1753 the number was raiſed to 130, and in 1763 to 140; but ſince that time it has decreaſed.—In this hoſpital the boys are inſtructed in reading, writing, arithmetic, and a knowledge of the Latin tongue. With ſuch as chooſe to follow any kind of trade, an apprentice-fee of 30l. is given when they leave the hoſpital; and thoſe who chooſe an academical education, have an annuity of 10l. a-year beſtowed on them for four years. The whole is under the overſight of the treaſurer, who has under him a houſe-governor, houſe-keeper, and ſchool-maſters.

17. *Watſon's Hoſpital* has its name from the founder George Watſon, who was at firſt clerk to Sir William Dick provoſt of Edinburgh in 1676, then accountant of the bank of Scotland; after that he became receiver of the city's impoſt on ale, treaſurer to the Merchant's Maiden Hoſpital, and to the ſociety for propagating Chriſtian knowledge. Dying a bachelor in 1723, he left 12,000l. for the maintenance and education of the children and grand-children of decayed members of the merchant company of Edinburgh. The ſcheme, however, was not put in execution till the year 1738, when the ſum originally left had accumulated to 20,000l. The preſent building was then erected, in which about 60 boys are maintained and educated. It is much leſs magnificent than Heriot's hoſpital, but the building is far from being deſpicable. It ſtands to the ſouthward of the city at a ſmall diſtance from Heriot's hoſpital, and was erected at the expence of 5000l.: its preſent revenue is about 1700l. It is under the management of the maſter, aſſiſtants, and treaſurer of the Merchant Company, four old bailies, the old dean of guild, and the two miniſters of the old church. The boys are genteelly clothed and liberally educated. Such as chooſe an univerſity education are allowed 10l. *per annum* for five years: thoſe who go to trades have 20l. allowed them for their apprentice fee; and at the age of 25 years, if they have behaved properly, and not contracted marriage without conſent of the governors, they receive a bounty of 50l. The boys are under the immediate inſpection of the treaſurer, ſchool-maſter, and houſe-keeper.

18. *The Merchants Maiden Hoſpital* was eſtabliſhed by voluntary contribution about the end of the laſt century, for the maintenance of young girls, daughters of the merchants burgeſſes of Edinburgh. The governors were erected into a body corporate, by act of parliament, in 1707. The annual revenue amounts to 1350l. Seventy girls are maintained in it; who, upon leaving the houſe, receive 3l. 6s. 8d. excepting

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(A) It is to be obſerved, that money then bore 10l. *per cent.* intereſt.—The above ſums are taken from Mr Arnot's Hiſtory of Edinburgh, who ſubjoins the following note. "Where Maitland had collected his moſt erroneous account of George Heriot's effects, we do not know. He makes the ſum received, out of Heriot's effects, by the governors of the hoſpital, to be 43,608l. 11s. 3d. being almoſt the double of what they really got. This blunder has been the cauſe of many unjuſt murmurings againſt the magiſtrates of Edinburgh, and even the means of ſpiriting up law-ſuits againſt them."

a few who are allowed 8l. 6s. 8d. out of the funds of the hoſpital. The profits ariſing from work done in the houſe are alſo divided among the girls, according to their induſtry.

19. *The Trades Maiden Hoſpital* was founded in the year 1704 by the incorporations of Edinburgh, for the maintenance of the daughters of decayed members, on a plan ſimilar to that of the merchants hoſpital. To this, as well as to the former, one Mrs Mary Erſkine, a widow gentlewoman, contributed ſo liberally, that ſhe was by the governors ſtyled *joint foundreſs* of the hoſpital. Fifty girls are maintained in the houſe, who pay of entry-money 1l. 13s. 4d.; and, when they leave it, receive a bounty of 5l. 11s. 1½d. The revenues are eſtimated at 600l. a-year.

20. *The Orphan Hoſpital* was planned in 1732 by Andrew Gairdner merchant, and other inhabitants. It was promoted by the ſociety for propagating Chriſtian knowledge, by other ſocieties, by voluntary ſubſcriptions, and a collection at the church-doors.—In 1733, the managers hired a houſe, took in 30 orphans, maintained them, gave them inſtructions in reading and writing, and taught them the weaving buſineſs. In 1735, they were erected into a body corporate by the town of Edinburgh: and, in 1742, they obtained a charter of erection from his late majeſty, appointing moſt of the great officers of ſtate in Scotland, and the heads of the different ſocieties in Edinburgh, members of this corporation; with powers to them to hold real property to the amount of 1000l. a-year. The revenue is inconſiderable; but the inſtitution is ſupported by the contributions of charitable perſons. Into this hoſpital orphans are received from any part of the kingdom. None are admitted under ſeven, nor continued in it after 14, years of age. At preſent (1790) about 140 orphans are maintained in it.

The orphan hoſpital is ſituated to the eaſt of the north bridge; and is a handſome building, conſiſting of a body and two wings, with a neat ſpire, furniſhed with a clock and two bells. The late worthy Mr Howard admits, that this inſtitution is one of the moſt ueſeful charities in Europe, and is a pattern for all inſtitutions of the kind. The funds have been conſiderably increaſed, and the building greatly improved, through the attention and exertions of Mr Thomas Tod the preſent treaſurer.

21. *The Trinity Hoſpital.* This was originally founded and amply endowed by king James II.'s queen. At the Reformation, it was ſtripped of its revenues; but the regent afterwards beſtowed them on the provoſt of Edinburgh, who gave them to the citizens for the uſe of the poor. In 1585, the town-council purchaſed from Robert Pont, at that time provoſt of Trinity college, his intereſt in theſe ſubjects; and the tranſaction was afterwards ratified by James VI. The hoſpital was then repaired, and appointed for the reception of poor old burgeſſes, their wives, and unmarried children, not under 50 years of age. In the year 1700, this hoſpital maintained 54 perſons; but, ſince that time, the number has decreaſed.—The revenue conſiſts in a real eſtate of lands and houſes, the groſs rent of which are 762l. a-year; and 5500l. lent out in bonds at 4 per cent.

This hoſpital is ſituated at the foot of Leith-wynd, and maintains about 50 of both ſexes, who are comfortably lodged, each having a room for themſelves. They are ſupplied with roaſt or boiled meat every day for dinner, have money allowed them for clothes, and likewiſe a ſmall ſum for pocket-money. There is a ſmall library for their amuſement, and they have a chaplain to ſay prayers. There are ſome out-penſioners who have 6l. a-year, but theſe are diſcouraged by the governors. The funds are under the management of the town-council.

22. *The Charity Workhouſe* was erected in 1743 by voluntary contribution. It is a large plain building, on the ſouth ſide of the city. Here the poor are employed, and are allowed twopence out of every ſhilling they earn. The expence of this inſtitution is ſuppoſed not to be leſs than 4000l. annually; as about 700 perſons of both ſexes, including children, are maintained here, each of whom cannot be reckoned to coſt leſs than 4l. 10s. *per annum;* and there are beſides 300 out-penſioners. The only permanent fund for defraying this expence is a tax of two *per cent.* on the valued rents of the city, which may bring in about 600l. annually; and there are other funds which yield about 400l. The reſt is derived from collections at the church doors and voluntary contributions; but as theſe always fall ſhort of what is requiſite, recourſe muſt frequently be had to extraordinary collections. The ſum ariſing from the rents of the city, however, is conſtantly increaſing; but the members of the College of Juſtice are exempted from the tax.

There are two other charity workhouſes in the ſuburbs, much on the ſame plan with that now deſcribed; one in the Canongate, and the other in St Cuthbert's or Weſt Kirk pariſh.

To this account of the charitable eſtabliſhments in Edinburgh, we ſhall add that of ſome others; which, though not calculated to decorate the city by any public building, are perhaps no leſs deſerving of praiſe than any we have mentioned. The firſt is that of Captain William Horn; who left 3500l. in truſt to the magiſtrates, the annual profits to be divided on Chriſtmas day to poor out-day labourers, who muſt at that ſeaſon of the year be deſtitute of employment; five pounds to be given to thoſe who have large families, and one half to thoſe who have ſmaller.

Another charity is that of Robert Johnſton, L.L.D. of London, who in 1640 left 3000l. to the poor of this city; 1000l. to be employed in ſetting them to work, another 1000l. to clothe the boys in Heriot's Hoſpital, and the third 1000l. to burſers at the univerſity.

About the beginning of this century John Strachen left his eſtate of Craigcrook, now upwards of 300l. a-year, in truſt to the preſbytery of Edinburgh, to be by them diſpoſed of in ſmall annual ſums to poor old people not under 65 years of age, and to orphans not above 12.

There is beſides a ſociety for the ſupport of the induſtrious poor, another for the indigent ſick, and there are alſo many charity-ſchools.

Having thus given an account of the moſt remarkable edifices belonging to Old Edinburgh, we ſhall now proceed to thoſe of the New Town. This is terminated on the eaſt ſide by the Calton-hill, round which there is a pleaſant walk, and which affords one of the fineſt proſpects that can be imagined, varying remarkably almoſt at every ſtep. On this hill is a burying-ground, which contains a fine monument to the memory of David Hume the hiſtorian.—On the top is an Obſervatory, the ſcheme for building which was firſt adopted in the year 1736; but the diſturbance occaſioned by the Porteous mob prevented any thing from being done towards the execution of it at that time. The Earl of Morton afterwards gave 100 l. for the purpoſe of building an obſervatory, and appointed Mr M'Laurin profeſſor of mathematics, together with the principal and ſome profeſſors of the univerſity, truſtees for managing the ſum. Mr M'Laurin added to the money above mentioned the profits ariſing from a courſe of lectures which he read on experimental philoſophy; which, with ſome other ſmall ſums, amounted in all to 300 l.: but Mr M'Laurin dying, the deſign was dropped.—Afterwards the money was put into the hands of two perſons who became bankrupt; but a conſiderable dividend being obtained out of their effects, the principal and intereſt, about the year 1776, amounted to 400 l. A plan of the building was made out by Mr Craig architect; and the foundation-ſtone was laid by Mr Stodart, lord provoſt of Edinburgh, on the 25th of Auguſt 1776. About this time, however, Mr Adam architect happening to come to Edinburgh, conceived the idea of giving the whole the appearance of a fortification, for which its ſituation on the top of the Calton-hill was very much adapted. Accordingly a line was marked out for incloſing the limits of the obſervatory with a wall conſtructed with buttreſſes and embraſures, and having Gothic towers at the angles. Thus the money deſigned for the work was totally exhauſted, and the obſervatory ſtill remains unfiniſhed; nor is there any appearance of its being ſoon completed either by voluntary ſubſcription or any other way.

23 Proceeding to the weſtward, the firſt remarkable building is the *Theatre*, which ſtands oppoſite to the Regiſter Office, in the middle of Shakeſpeare Square. The building is plain on the outſide, but elegantly fitted up within, and is generally open three days in the week, and when full will draw about 150 l. a-night; ſo that the manager generally finds himſelf well rewarded when he can procure good actors.

Entertainments of the dramatic kind came very early into faſhion in this country. They were at firſt only repreſentations of religious ſubjects, and peculiarly deſigned to advance the intereſts of religion; the clergy being the compoſers, and Sunday the principal time of exhibition. In the 16th century, the number of playhouſes was ſo great, that it was complained of as a nuiſance, not only in Edinburgh, but throughout the kingdom. They ſoon degenerated from their original inſtitution; and the plays, inſtead of being calculated to inſpire devotion, became filled with all manner of buffoonery and indecency.—After the Reformation, the Preſbyterian clergy complained of theſe indecencies; and being actuated by a ſpirit of violent zeal, anathematiſed every kind of theatrical repreſentation whatever. King James VI. compelled them to paſs from their cenſures againſt the ſtage; but in the time of Charles I. when fanaticiſm was carried to the utmoſt length at which perhaps it was poſſible for it to arrive, it cannot be ſuppoſed that ſtage plays would be tolerated.—It ſeems, however, that amuſements of this kind were again introduced at Edinburgh about the year 1684, when the Duke of York kept his court there. His reſidence at Edinburgh drew off one half of the London company, and plays were acted in Edinburgh for ſome little time. The misfortunes attending the Duke of York, however, and the eſtabliſhment of the Preſbyterian religion (the genius of which is unfavourable to amuſements of this kind), ſoon put a ſtop to the progreſs of the ſtage, and no theatrical exhibition was heard of in Edinburgh till after the year 1715. The firſt adventurer was Signora Violante, an Italian, remarkable for feats of ſtrength, tumbling, &c. In this way ſhe firſt exhibited in a houſe at the foot of Carrubber's Cloſe, which has ſince been employed by different ſectaries for religious purpoſes. Meeting with good ſucceſs, ſhe ſoon invited a company of comedians from London; and theſe being alſo well received, Edinburgh continued for ſome years to be entertained with the performances of a ſtrolling company, who viſited it annually. Becoming at laſt, however, obnoxious to the clergy, they were in 1727 prohibited by the magiſtrates from acting within their juriſdiction. But this interdict was ſuſpended by the Court of Seſſion, and the players continued to perform as uſual.

Still, however, theatrical entertainments were but rare. The town was viſited by itinerant companies only once in two or three years. They performed in the Taylor's Hall in the Cowgate; which, when the houſe was full, would have drawn (at the rate of 2 s. 6d. for pit and boxes, and 1 s. 6d. for the gallery) 40l. or 45 l. a-night. About this time an act of parliament was paſſed, prohibiting the exhibition of plays, except in a houſe licenſed by the king. Of this the preſbytery of Edinburgh immediately laid hold; and at their own expence brought an action on the ſtatute againſt the players. The cauſe was by the Court of Seſſion decided againſt the players; who thereupon applied to parliament for a bill to enable his majeſty to licenſe a theatre in Edinburgh. Againſt this bill petitions were preſented in 1739 to the houſe of commons by the magiſtrates and town-council, the principal and profeſſors of the univerſity, and the dean of guild and his council; in conſequence of which, the affair was dropped. All this oppoſition, however, contributed in reality to the ſucceſs of the players; for the ſpirit of party being excited, a way of evading the act was eaſily found out, and the houſe was frequented more than uſual, inſomuch that Taylor's Hall was found inſufficient to contain the number of ſpectators.

The comedians now fell out among themſelves, and a new playhouſe was erected in the Canongate in the year 1746. The conſequence of this was, that the old one in Taylor's Hall became entirely deſerted, and through bad conduct the managers of the new theatre ſoon found themſelves greatly involved. At laſt, a riot enſuing through diſſenſions among the performers, the playhouſe was totally demoliſhed.—When the extenſion of the royalty over the ſpot where the New Town is built was obtained, a clauſe was likewiſe added to the bill, enabling his majeſty to licenſe a theatre in Edinburgh. This was obtained, and thus the oppoſition of the clergy for ever ſilenced. But notwithſtanding

this,

this, the high price paid by the managers to the patentee, being no leſs than 500 guineas annually, prevented them effectually from decorating the houſe as they would otherwiſe have done, or even from always retaining good actors in their ſervice; by which means the ſucceſs of the Edinburgh theatre has not been ſo great as might have been expected.

Not far from this building, an amphitheatre was opened in 1790, on the road to Leith, for equeſtrian exhibitions, pantomime entertainments, dancing, and tumbling. The circus is 60 feet diameter; and in the forenoon ladies and gentlemen are taught to ride. The houſe will hold about 1500 people.

24. *The Regiſter Office.* This work was firſt ſuggeſted by the late Earl of Morton, lord-regiſter of Scotland, with a view to prevent the danger which attended the uſual method of keeping the public records. In former times, indeed, theſe ſuffered from a variety of accidents. Edward I. carried off or deſtroyed moſt of them, in order to prevent any marks of the former independency of the nation from remaining to poſterity. Afterwards Cromwell ſpoiled this nation of its records, moſt of which were ſent to the tower of London At the time of the Reſtoration, many of them were ſent down again by ſea; but one of the veſſels was ſhipwrecked, and the records brought by the other have ever ſince been left in the greateſt confuſion.—The Earl of Morton taking this into conſideration, obtained from his majeſty a grant of 12,000l. out of the forfeited eſtates, for the purpoſe of building a regiſter-office, or houſe for keeping the records, and diſpoſing them in proper order. The foundation was laid on the 27th of June 1774, by Lord Frederic Campbell lord-regiſter, Mr Montgomery of Stanhope lord advocate, and Mr Miller of Barſkimming lord juſtice-clerk; three of the truſtees appointed by his majeſty for executing the work. The ceremony was performed under a diſcharge of artillery, in preſence of the judges of the courts of ſeſſion and exchequer, and in the ſight of a multitude of ſpectators. A braſs plate was put into the foundation-ſtone with the following inſcription: CONSERVANDIS TABULIS PUBLICIS POSITUM EST, ANNO M.DCC LXXIV, MUNIFICENTIA OPTIMI ET PIETISSIMI PRINCIPIS GEORGII TERTII. In a glaſs vaſe hermetically ſealed, which is alſo placed in the foundation-ſtone, are depoſited ſpecimens of the different coins of his preſent majeſty.

The front of the building directly faces the bridge, extends from eaſt to weſt 200 feet, and is 40 feet back from the line of Prince's-ſtreet. In the middle of the front is a ſmall projection of three windows in breadth. Here is a pediment, having in its centre the arms of Great Britain, and the whole is ſupported by four Corinthian pilaſtres. At each end is a tower projecting beyond the reſt of the building, having a Venetian window in front, and a cupola on the top. The front is ornamented from end to end with a beautiful Corinthian entablature. In the centre of the building is a dome of wooden work covered with lead. The inſide forms a ſaloon 50 feet diameter and 80 high, lighted at top by a copper window 15 feet in diameter. Round the whole is a hanging gallery of ſtone, with an iron baluſtrade, which affords conveniency for preſſes in the walls for keeping the records. The whole number of apartments is 97; all of which are vaulted beneath, and warmed with fire-places. This building, which is the moſt beautiful of Mr Adams's deſigns, has been executed in a ſubſtantial manner, in about 16 years, at the expence of near 40,000l. and is one of the principal ornaments of the city. A ſerjeant's guard is placed here from the caſtle, for the further protection of the records. It is intended to place a ſtatue of his preſent Majeſty in the front of the building, with the lion and unicorn above the centinels boxes. The lord-regiſter has the direction of the whole, and the principal clerks of Seſſion are his deputes. Theſe have a great number of clerks under them for carrying on the buſineſs of the Court of Seſſion. The lord-regiſter is a miniſter of ſtate in this country. He formerly collected the votes of the parliament of Scotland, and ſtill collects thoſe of the peers at the election of 16 to repreſent them in parliament.

25. On the eaſt ſide of St Andrew's Square ſtands the *General Exciſe Office*, built by the late Sir Laurence Dundas for his own reſidence, but ſold by his ſon for the above purpoſe. It is a very handſome building, with a pediment in front ornamented with the king's arms, and ſupported by four Corinthian pilaſtres; and, in conjunction with the two corner houſes, has a fine effect.

26. *St Andrew's Church* ſtands on the north ſide of George's Street. It is of an oval form; and has a very neat ſpire of 186 feet in height, with a chime of eight bells, the firſt and only one of the kind in Scotland. It has alſo a handſome portico in front.

27. Oppoſite to St Andrew's church is the *Phyſicians Hall*, deſigned for the meetings of the faculty, and which has a portico reſembling that of the church.

28. Farther to the weſtward, on the ſouth ſide, ſtand the *Aſſembly-rooms*, which though a heavy looking building on the outſide, are nevertheleſs extremely elegant and commodious within. The largeſt is 100 feet long and 40 broad, being exceeded in its dimenſions by none in the iſland, the large one at Bath excepted. Weekly aſſemblies are held here for dancing and card-playing, under the direction of a maſter of ceremonies; admiſſion-tickets five ſhillings each.

29 Religious eſtabliſhments.

It now remains only to ſpeak ſomething of the religious and civil eſtabliſhments of this metropolis. The higheſt of the former is the General Aſſembly of the Church of Scotland, who meet here annually in the month of May, in an aiſle of the church of St Giles fitted up on purpoſe for them. The throne is filled by a commiſſioner from his majeſty, but he neither debates nor votes. He calls them together, and diſſolves them at the appointed time in the name of the king; but they call and diſſolve themſelves in the name of the Lord Jeſus Chriſt. This aſſembly conſiſts of 350 members choſen out of the various preſbyteries throughout the kingdom; and the debates are often very intereſting and eloquent. This is the ſupreme eccleſiaſtical court in Scotland, to which appeals lie from the inferior ones.

The eccleſiaſtical court next in dignity to the aſſembly is the Synod of Lothian and Tweeddale, who meet in the ſame place in April and November; and next to them is the Preſbytery of Edinburgh. Theſe meet on the laſt Wedneſday of every month, and are truſtees on the fund for miniſters widows. They have a hall in Scott's cloſe, where there is a good picture of Dr Webſter by Martin, which was put up at the expence of the truſtees, out of gratitude for the trouble he took in planning and fully eſtabliſhing the fund.

The Society for Propagating Chriſtian Knowledge in the Highlands and Iſlands of Scotland, was eſtabliſhed a body corporate by queen Anne in the year 1709, for the purpoſe of erecting ſchools to inſtruct poor children in the principles of Chriſtianity, as well as in reading and writing. The ſociety have a hall in Warriſton's cloſe where their buſineſs is tranſacted. From time to time they have received large contributions, which have always been very properly applied; and for much the ſame purpoſe his majeſty gives 1000 l. annually to the general aſſembly of the church of Scotland, which is employed by a committee of their number for inſtructing the poor Highlanders in the principles of the Chriſtian religion.

The Earſe church at Edinburgh was built about 20 years ago by ſubſcription for the ſame laudable purpoſe. Great numbers of people reſort to the metropolis from the Highlands, who underſtand no other language but their own, and conſequently have no opportunity of inſtruction without it; and a moſt remarkable proof of the benefit they have received from it is, that though the church is capable of holding 1000 people, yet it is not large enough for thoſe who apply for ſeats. The miniſter has 100 l. *per annum* ariſing from the ſeat-rents, and holds communion with the church of Scotland. The eſtabliſhment was promoted by William Dickſon dyer in Edinburgh.

30 Political conſtitution.

With regard to the political conſtitution of Edinburgh, the town-council have the direction of all public affairs. The *ordinary* council conſiſts only of 25 perſons; but the *council ordinary and extraordinary*, of 33. The whole is compoſed of merchants and tradeſmen, whoſe reſpective powers and intereſts are ſo interwoven, that a balance is preſerved between the two bodies. The members of the town-council are partly elected by the members of the 14 incorporations, and they partly chooſe their own ſucceſſors. The election is made in the following manner: Firſt a liſt or *leet* of ſix perſons is made out by each incorporation; from which number, the deacon belonging to that incorporation muſt be choſen. Theſe liſts are then laid before the ordinary council of 25, who "ſhorten the *leets*," by expunging one half of the names from each; and from the three remaining ones the deacon is to be choſen. When this election is over, the new deacons are preſented to the ordinary council, who chooſe ſix of them to be members of their body, and the ſix deacons of laſt year then walk off. The council of 25 next proceed to the election of three merchant and two trades counſellors. The members of council, who now amount to 33 in number, then make out *leets*, from which the lord provoſt, dean of guild, treaſurer, and bailies muſt be choſen. The candidates for each of theſe offices are three in number; and the election is made by the 30 members of council already mentioned, joined to the eight *extraordinary* council-deacons.

The lord provoſt of Edinburgh, who is ſtyled *right honourable*, is high ſheriff, coroner, and admiral, within the city and liberties, and the town, harbour, and road of Leith. He has alſo a juriſdiction in matters of life and death. He is preſes of the convention of royal boroughs, colonel of the trained bands, commander of the city-guard and of Edinburgh jail. In the city he has the precedency of all the great officers of ſtate and of the nobility; walking on the right hand of the king or of his majeſty's commiſſioner; and has the privilege of having a ſword and mace carried before him. Under him are four magiſtrates called *bailies*, whoſe office is much the ſame with that of aldermen in London. There is alſo a dean of guild, who has the charge of the public buildings, and without whoſe warrant no houſe nor building can be erected within the city. He has a council to conſult with, a nominal treaſurer, who formerly had the keeping of the town's money, which is now given to the chamberlain. Theſe ſeven are elected annually; who with the ſeven of the former year, three merchants and two trades counſellors, and 14 deacons or preſes of incorporated trades, making in all 33, form the council of the city, and have the ſole management and diſpoſal of the city revenues; by which means they have the diſpoſal of places to the amount of 20,000 l. annually. Formerly the provoſt was alſo an officer in the Scots parliament. The magiſtrates are ſheriffs-depute and juſtices of the peace; and the town council are alſo patrons of all the churches in Edinburgh, patrons of the univerſity, and electors of the city's repreſentative in parliament. They have beſides a very ample juriſdiction both civil and criminal. They are ſuperiors of the Canongate, Portſburgh, and Leith; and appoint over theſe certain of their own number, who are called *baron bailies:* but the perſon who preſides over Leith has the title of *admiral*, becauſe he hath there a juriſdiction over maritime affairs. The baron bailies appoint one or two of the inhabitants of their reſpective diſtricts to be their ſubſtitutes, and theſe are called *reſident bailies*. They hold courts in abſence of the baron-bailies, for petty offences, and diſcuſſing civil cauſes of little moment.

31 Town guard.

No city in the world affords greater ſecurity to the inhabitants in their perſons and properties than Edinburgh. Robberies are here very rare, and a ſtreet-murder hardly known in the memory of man; ſo that a perſon may walk the ſtreets at any hour of the night in perfect ſecurity. This is in a great meaſure owing to the *town-guard*. This inſtitution originated from the conſternation into which the citizens were thrown after the battle at Flowden. At that time, the town-council commanded the inhabitants to aſſemble in defence of the city, and every fourth man to be on duty each night. This introduced a kind of perſonal duty for the defence of the town, called *watching and warding*; by which the trading part of the inhabitants were obliged in perſon to watch alternately, in order to prevent or ſuppreſs occaſional diſturbances. This, however, becoming in time extremely inconvenient, the town-council, in 1648, appointed a body of 60 men to be raiſed; the captain of which was to have a monthly pay of 11 l. 2s. 3d. two lieutenants of 2l. each, two ſerjeants of 1 l. 5s. and the private men of 15s. each. No regular fund was eſtabliſhed for defraying this expence; the conſequence of which was, that the old method of watching and warding was reſumed: but the people on whom this ſervice devolved were now become ſo relaxed in their diſcipline, that the magiſtrates were threatened with having the king's troops

troops quartered in the city if they did not appoint a ſufficient guard. On this 40 men were raiſed in 1679, and in 1682 the number was increaſed to 108. After the revolution, the town-council complained of the guard as a grievance, and requeſted parliament that it might be removed. Their requeſt was immediately granted, and the old method of watching and warding was renewed. This, however, was now ſo intolerable, that the very next year they applied to parliament for leave to raiſe 126 men for the defence of the city, and to tax the citizens for their payment. This being granted, the corps was raiſed which ſtill continues under the name of the *town-guard*. At preſent the eſtabliſhment conſiſts of three officers and about 90 men, who mount guard by turns. The officers have a lieutenant's pay; the ſerjeants, corporals, drummers, and common ſoldiers, the ſame with thoſe of the army. Their arms are the ſame with thoſe of the king's forces; but when called upon to quell mobs, they uſe Lochaber-axes, a part of the ancient Scottiſh armour now in uſe only among themſelves.

The militia or trained band of the city conſiſt of 16 companies of 100 men each. They were in uſe to turn out every king's birth-day; but only the officers now remain, who are choſen annually. They conſiſt of 16 captains and as many lieutenants; the provoſt, as has already been mentioned, being the colonel.

The town-guard are paid chiefly by a tax on the trading people; theſe being the only perſons formerly ſubject to watching and warding. This tax, however, amounts only to 1250l. and as the expence of the guard amounts to 1400l. the magiſtrates are obliged to defray the additional charge by other means.

The number of inhabitants in the city of Edinburgh is ſomewhat uncertain, and has been very variouſly calculated. By a ſurvey made in the year 1775, it appears that the number of families in the city, Canongate, and other ſuburbs, and the town of Leith, amounted to 13,806. The difficulty therefore is to fix the number of perſons in a family. Dr Price fixes this number at $4\frac{1}{15}$; Mr Maitland, at $5\frac{1}{4}$; and Mr Arnot, at 6: ſo that, according to this laſt gentleman, the whole number of inhabitants is 82,836; to which he thinks 1400 more may be added for thoſe in the garriſon, hoſpitals, &c. There are in Edinburgh 14 incorporations, capable of chooſing their own deacons, viz. The royal college of ſurgeons; the corporations of goldſmiths, ſkinners, furriers, hammermen, wrights and maſons, taylors, bakers, butchers, ſhoemakers, weavers, waukers, bonnet-makers, and merchant-company. The revenue of the city, ariſing partly from duties of different kinds, and partly from landed property, is eſtimated at about 10,000l. per annum.

The markets of Edinburgh are plentifully ſupplied with all ſorts of proviſions. Freſh butcher-meat, as well as fowl and fiſh, if the weather permit, may be had every day; and no city can be better ſupplied with garden ſtuffs. The Edinburgh ſtrawberries particularly are remarkably large and fine. A remarkable inſtance of the plenty of proviſions with which Edinburgh is ſupplied was obſerved in the year 1779, when ſeveral large fleets, all of them in want of neceſſaries, arrived in the Forth, to the amount of about 500 ſail, and having on board at leaſt 20,000 men; yet the increaſed conſumption of proviſions, which certainly enſued upon the arrival of ſo many ſtrangers, made not the leaſt increaſe in the rate of the markets, inſomuch that ſeveral victualling ſhips ſent down by the navy-board returned without opening their hatches. The city-mills are let to the corporation of bakers in Edinburgh; and the bread made in the city is remarkable for its goodneſs.

Edinburgh is ſupplied with water brought for ſome miles in pipes, and lodged in two reſervoirs, from whence it is diſtributed through the city both to public wells and private families. A revenue accrues to the town from the latter, which muſt undoubtedly increaſe in proportion as the city extends in magnitude.

There are but few merchants in Edinburgh, moſt of them reſiding at the port of Leith; ſo that the ſupport of the city depends on the conſumption of the neceſſaries as well as the ſuperfluities of life. There are five different ſorts of people on whom the ſhopkeepers, publicans, and different trades depend: 1. The people of the law, who are a very reſpectable body in the city. 2. The number of young people of both ſexes who come to town for their education, many of the parents of whom come along with them. 3. The country gentlemen, gentlemen of the army and navy, and people who have made their fortunes abroad, &c. all of whom come to attend the public diverſions, or to ſpend their time in ſuch a manner as is moſt agreeable to them. 4. The vaſt concourſe of travellers from all parts. 5. Moſt of the money drawn for the rents of country gentlemen is circulated among the bankers or other agents.

At Edinburgh there are excellent manufactures of linen and cambrics; there are alſo manufactures of paper in the neighbourhood, and printing is carried on very extenſively. But for ſome time the capital branch about Edinburgh has been building: which has gone on, and ſtill continues to do ſo, with ſuch rapidity, that the city has been increaſed exceedingly in its extent; and it is not uncommon to ſee a houſe built in a few months, and even inhabited before the roof is quite finiſhed.

EDITOR, a perſon of learning, who has the care of an impreſſion of any work, particularly that of an ancient author: thus, Eraſmus was a great editor; the Louvain doctors, Scaliger, Petavius, F. Sirmond, biſhop Walton, Mr Hearne, Mr Ruddiman, &c. are likewiſe famous editors.

EDOM, or ESAU, the ſon of Iſaac and brother of Jacob. The name of Edom, which ſignifies *red*, was given him, either becauſe he ſold his birth-right to Jacob for a meſs of red pottage, or by reaſon of the colour of his hair and complexion. Idumea derives its name from Edom, and is often called in ſcripture the land of Edom. See the next article.

EDOM, or IDUMÆA (anc. geog.), a diſtrict of Arabia Petræa; a great part alſo of the ſouth of Judæa was called Idumæa, becauſe occupied by the Idumæans, upon the Jewiſh captivity, quite to Hebron. But the proper Edom or Idumæa appears not to have been very extenſive, from the march of the Iſraelites, in which they compaſſed it on the ſouth eaſtwards, till they

they came to the country of the Moabites. Within this compaſs lies mount Hor, where Aaron died; marching from which the Iſraelites fought with king Arad the Canaanite, who came down the wilderneſs againſt them (Moſes). And this is the extent of the *Idumæa Propria,* lying to the ſouth of the Dead Sea; but in Solomon's time extending to the Red Sea (1 Kings ix. 26.)

EDMUND I. and II. See *(Hiſtory of)* ENGLAND.

1 Definition.

EDUCATION may be defined, that ſeries of means by which the human underſtanding is gradually enlightened, and the diſpoſitions of the human heart are formed and called forth between earlieſt infancy and the period when we conſider ourſelves as qualified to take a part in active life, and, ceaſing to direct our views ſolely to the acquiſition of new knowledge or the formation of new habits, are content to act upon the principles which we have already acquired.

2 Particulars comprehended under the definition.

This comprehends the circumſtances of the child in regard to local ſituation, and the manner in which the neceſſaries and conveniences of life are ſupplied to him; the degree of care and tenderneſs with which he is nurſed in infancy; the examples ſet before him by parents, preceptors, and companions; the degree of reſtraint or licentiouſneſs to which he is accuſtomed; the various bodily exerciſes, languages, arts, and ſciences, which are taught him, and the method and order in which they are communicated; the moral and religious principles which are inſtilled into his mind; and even the ſtate of health which he enjoys during that period of life.

3 Various modes of education have prevailed.

In different periods of ſociety, in different climates, and under different forms of goverment, various inſtitutions have naturally prevailed in the education of youth; and even in every different family, the children are educated in a different manner, according to the differences in the ſituation, diſpoſitions, and abilities, of the parents. The education of youth being an object of the higheſt importance, has not only engaged the anxious care of parents, but has likewiſe often attracted the notice of the legiſlator and the philoſopher. What our readers have therefore a right to expect from us on this article is, 1ſt, That we give an account of ſome of the moſt remarkable inſtitutions for the education of youth which have been legally eſtabliſhed or have accidentally prevailed among various nations and in various periods of ſociety. 2dly, That we alſo give ſome account of the moſt judicious and the moſt fanciful plans which have been propoſed by thoſe authors who have written on the ſubject of education. And, laſtly, that we venture to preſent them with the reſult of our own obſervations and recollections on this important head.

4 Plan.

5 Education in a ſavage ſtate.

In the infancy of ſociety, very little attention can be paid to the education of youth. Before men have riſen above a ſavage ſtate, they are almoſt entirely the creatures of appetite and inſtinct. The impulſe of appetite hurries them to propagate their ſpecies. The power of inſtinctive affection is often, though not always, ſo ſtrong as to compel them to preſerve and nurſe the fruit of their embraces. But even when their wants are not ſo urgent, nor their hearts ſo deſtitute of feeling, as to prompt them to abandon their new-born infants to the ferocity of wild beaſts or the ſeverity of the elements, yet ſtill their uncomfortable and precarious ſituation, their ignorance of the laws of nature, their deficiency of moral and religious principles, and their want of dexterity or ſkill in any of the arts of life, all theſe together muſt render them unable to regulate the education of their children with much attention or ſagacity. They may relate to them the wild inconſiſtent tales in which all their notions concerning ſuperior beings and all their knowledge of the circumſtances and tranſactions of their anceſtors are contained; they may teach them to bend the bow, to point their arrows, to hollow the trunk of a tree into a canoe, and to trace the almoſt imperceptible path of an enemy or a wild beaſt over dreary mountains or through intricate foreſts: but they cannot impreſs their minds with juſt ideas concerning their ſocial relations, or concerning their obligations to a Supreme Being, the framer and upholder of nature: they teach them not to repreſs their irregular appetites, nor to reſtrain the ſallies of paſſion when they exceed juſt bounds or are improperly directed; nor can they inform their underſtandings with very accurate or extenſive views of the phenomena of nature. Beſides, they know not how far implicit obedience to his parents commands is to be required of the boy or youth, nor how far he ought to be left to the guidance of his own reaſon or humour. Among ſavages the influence of parental authority ſoon expires, nor is the parent ſolicitous to maintain it. As the eagle expels his young from his lofty neſt as ſoon as they become able to ſupport themſelves in the air; ſo the ſavage generally ceaſes to care for his child, or aſſume any power over him, as ſoon as he becomes capable of procuring the means neceſſary for his own ſubſiſtence. Savages being ſcarce connected by any ſocial ties, being unacquainted with the reſtraint of civil laws, and being unable to contribute in any great degree to the maintenance or protection of one another; each individual among them, as ſoon as he attains that degree of ſtrength and dexterity which may enable him to procure the neceſſaries of life, ſtands ſingle and alone, independent on others, and ſcorning to ſubmit to their commands. The parent, conſcious of his inability to confer any important benefits on his child, after he has advanced even a very ſhort way towards manhood, no longer endeavours to controul his actions; and the child, proud of his independence, ſcarce ſubmits to aſk his parent's advice. And even before reaching this period of independence, ſo few are the benefits which parents can beſtow (being confined to ſupplying the neceſſaries of life, and communicating the knowledge of a very few of the rudeſt ſimpleſt arts), that children regard them with little deference, nor do *they* always inſiſt on implicit ſubmiſſion. Want of natural affection, and conſciouſneſs of ſuperior ſtrength, often prompt the parent to abuſe the weakneſs of his child. Yet though ſmall the ſkill with which the ſavage can cultivate the underſtanding or form the diſpoſitions of his child, though few the arts which he can teach him, and though not very reſpectful or ſubmiſſive the obedience or deference which he requires; yet is there one quality of mind which the ſavage is more careful to inſpire than thoſe parents who are directed in educating their children by all the lights of civilized ſociety. That quality is indeed abſolutely neceſſary to fit the ſavage for his ſituation; without it, the day on which he ceaſed

ceaſed to enjoy the protection of his parents would moſt probably be the laſt day of his life: That quality is Fortitude. We may perhaps think, that the hardſhips to which the young ſavage is from the period of his birth unavoidably expoſed, might be enough to inſpire him with fortitude; but, as if theſe were inſufficient, other means are applied to inſpire him with what the Stoics have regarded as the firſt of virtues. He is compelled to ſubmit to many hardſhips unneceſſary, but from a view to this. Children are there called to emulate each other in bearing the ſevereſt torments. Charlevoix relates, that he has ſeen a boy and girl bind their arms together, place a burning coal between them, and try who could longeſt endure without ſhrinking the pain to which they thus expoſed themſelves.

Still, however, the young ſavage owes his education rather to nature and to the circumſtances in which he is placed, and the accidents which befal him, than to the kindneſs or prudence of his parents. Nature has endowed him with certain powers of underſtanding, ſentiments, ſenſations, and bodily organs; he has been placed in certain circumſtances, and is expoſed to a certain train of events; and by theſe means chiefly, not by the watchful induſtry of inſtructors, does he become ſuch as he appears when he has reached the years of maturity.

But man was not deſigned by his wiſe and beneficent Creator to remain long in a ſavage ſtate; the principles of his nature incline him to ſocial life. Reaſon, diſtinguiſhing the ſuperior advantages to be enjoyed in ſociety, concurs with the ſocial principle in his breaſt, in prompting him to ſeek the company and converſation of others of the human race. When men enter into ſociety, they always unite their powers and talents, in a certain degree, for the common advantage of the ſocial body. In conſequence of this, laws come in time to be inſtituted; new arts are invented; progreſs is made in the knowledge of nature; moral duties are better underſtood and defined; juſter ideas are gradually acquired of all our ſocial relations; friendſhip, love, filial, parental, and conjugal affection, all are heightened and refined. All theſe advantages do not inſtantly reſult from mens entering into a ſocial ſtate; the improvement of the human mind, and the civilization of ſociety, are gradual and progreſſive: But as it is natural for men to unite in a ſocial ſtate, ſo it is no leſs natural for ſociety to be gradually improved and civilized till it attain an high degree of perfection and refinement.

8

When men have attained to ſuch knowledge and improvement as to be intitled to a more honourable appellation than that of ſavages, one part of their improvements generally conſiſts in their becoming more judicious and attentive in directing the education of their youth. They have now acquired ideas of dependence and ſubordination; they have arts to teach and knowledge to communicate; they have moral principles to inſtil; and have formed notions of their relation and obligations to ſuperior powers, which they are deſirous that their children ſhould alſo entertain. Their affection to their offspring is now alſo more tender and conſtant. We obſerve at preſent in that ſtate of ſociety in which we live, that the poor who can ſcarce earn for themſelves and their children the neceſſaries of life, are generally leſs ſuſceptible of parental affection, in all its anxious tenderneſs, than the rich, or thoſe whom Providence hath placed in eaſy circumſtances; and we may make uſe of this fact in reaſoning concerning the different degrees of the ſame affection felt by the ſavage and the member of a civilized ſociety. The ſavage may be conſidered as the poor man, who with difficulty procures the neceſſaries of life even for himſelf; the other, as the man in affluent circumſtances, who is more at leiſure to liſten to the voice of tender and generous affection.

In this improved ſtate of ſociety, the education of youth is viewed as an object of higher importance. The child is dearer to his parent; and the parent is now more capable of cultivating the underſtanding and rectifying the diſpoſitions of his child. His knowledge of nature, and his dexterity in the arts of life, give him more authority over a child than what the ſavage can poſſeſs. Obedience is now enforced, and a ſyſtem of education is adopted; by means of which the parent attempts to form his child for acting a part in ſocial life. Perhaps the legiſlature interferes; the education of the youth is regarded as highly worthy of public concern; it is conſidered that the fooliſh fondneſs or the unnatural caprice of parents may, in the riſing generation, blaſt the hopes of the ſtate.

9
Public eſtabliſhments for education among the ancients.

In reviewing ancient hiſtory, we find that this actually took place in ſeveral of the moſt celebrated governments of antiquity. The Perſians, the Cretans, and the Lacedemonians, were all of them too anxious to form their youth for diſcharging the duties of citizens to entruſt the education of the children ſolely to the parents. Public eſtabliſhments were formed among thoſe nations, and a ſeries of inſtitutions enacted, for carrying on and regulating the education of their youths: Not ſuch as our European univerſities, in which literary knowledge is the ſole object of purſuit, the ſtudent is maintained ſolely at his parents expence, and attends only if his parents think proper to ſend him; but of a very different nature, and on a much more enlarged plan.

10
Among the ancient Perſians.

The Perſians, according to the elegant and accurate account delivered by Xenophon in the beginning of his Cyropædia, divided the whole body of their citizens into four orders; the boys, the youth, the full-grown men, and thoſe who were advanced beyond that period of life during which military ſervice was required. For each of theſe orders particular halls were appropriated. Each of them was ſubjected to the inſpection of twelve rulers. The adults and the ſuperannuated were required to employ themſelves in the performance of particular duties, ſuitable to their age, their abilities, and their experience; while the boys and the youth were engaged in ſuch a courſe of education as ſeemed likely to render them worthy and uſeful citizens.

The boys were not employed, in their places of inſtruction, in acquiring literary accompliſhments; for to ſuch the Perſians were ſtrangers. They went thither to learn juſtice, temperance, modeſty; to ſhoot the bow, and to lanch the javelin. The virtues and the bodily exerciſes were what the Perſians laboured to teach their children. Theſe were the direct, and not ſubordinate, purpoſes of their ſyſtem of education. The maſters uſed to ſpend the greateſt part of the day in diſpenſing juſtice to their ſcholars; who carried before them actions for thefts, robberies, frauds, and other ſuch grounds of complaint againſt one another.—Such were the means by which the Perſians endeavoured to inſtil, even in early youth, a regard for the laws of natural equity, and for the inſtitutions of their country. Till the age of 16 or 17, the boys were buſied in acquiring thoſe parts of education. At that period they ceaſed to be conſidered as boys, and were raiſed to the order of the youths. After they entered this order, the ſame views were ſtill attended to in the carrying on of their education. They were ſtill enured to bodily labour. They were to attend the magiſtrates, and to be always ready to execute their commands. They were led out frequently to the chace; and on ſuch expeditions they were always headed by the king, as in time of war. Here they were taught to expoſe themſelves fearleſsly to danger; to ſuffer, without repining or complaint, hunger, thirſt, and fatigue; and to content themſelves with the coarſeſt, ſimpleſt fare, for relieving the neceſſities of nature. In ſhort, whether at home or out on ſome hunting expedition, they were conſtantly employed in acquiring new ſkill and dexterity in military exerciſes, new vigour of mind and body, and confirmed habits of temperance, fortitude, abſtinence, patience, patriotiſm, and noble integrity. After ſpending ten years in this manner, their courſe of education was completed; they were admitted into the claſs of the adults, and were eſteemed qualified for public offices. It muſt not eſcape our notice, that the citizens were not compelled to ſend their children to paſs through this courſe of education in the public halls; but none except ſuch as paſſed through this courſe of education were capable of civil power, or admitted to participate in public offices or public honours.

Such are the outlines of that ſyſtem of education which Xenophon repreſents as publicly eſtabliſhed among the Perſians. Were we able to preſerve in a tranſlation all the manly and graceful ſimplicity of that enchanting author, we would have offered to the peruſal of our readers the paſſage in which he has deſcribed it; but conſcious of being inadequate to that taſk, we have preſumed only to extract the information which it contains.

11 Remarks on Xenophon's account of Perſian education.

Perhaps, however, this ſyſtem of education did not ſubſiſt preciſely as the eloquent diſciple of Socrates deſcribes it among that rude and ſimple people. On other occaſions he has commemorated ſuch inſtances of their barbarity, as would tempt us to think them incapable of ſo much order and ſo much wiſdom. Perhaps, as the diſcoverers of the new world have ſometimes conferred on the inhabitants of that hemiſphere, in the accounts of them with which they entertained their friends in Europe, amazing degrees of moral and political wiſdom, of ſkill and dexterity in the arts, of induſtry and valour, which thoſe uncivilized children of nature were afterwards found not to poſſeſs; ſo the Athenian philoſopher has alſo aſcribed to the Perſians prudence and attention in regulating the education of their youth beyond what people in ſo rude a ſtate can poſſibly exert.

But if we examine into the principles on which this ſyſtem of education proceeds, without concerning ourſelves whether it once actually prevailed among the Perſians, or is the production of the fine imagination of Xenophon, we will find it peculiarly ſuitable for a nation juſt emerging from the rudeneſs and ignorance of barbarity to a knowledge of ſocial and civil relations, and of the duties connected with ſuch relations. They have ſacrificed their independence to obtain the comfort and ſecurity of a ſocial ſtate. They now glory in the appellation of citizens, and are deſirous to diſcharge the duties incumbent on a citizen. They muſt inform their children in the nature of their ſocial relations, and impreſs them with habits of diſcharging their ſocial duties; otherwiſe the ſociety will ſoon be diſſolved, and their poſterity will fall back into the ſame wild miſerable ſtate from which they have emerged. But perhaps the circumſtances, or abilities, or diſpoſitions of individuals, render them unequal to this weighty taſk. It becomes therefore naturally an object of public care. The whole ſocial body find it neceſſary to deliberate on the moſt proper means for diſcharging it aright. A plan of education is then formed; the great object of which is, to fit the youth for diſcharging the duties of citizens. Arts and ſciences are hitherto almoſt wholly unknown: and all that can be communicated to the youth is only a ſkill in ſuch exerciſes as are neceſſary for their procuring ſubſiſtence, or defending themſelves againſt human enemies or beaſts of prey; and habits of performing thoſe duties, the neglect of which muſt be fatal to the ſociety or the individual.

Such is the ſyſtem of education which we have ſurveyed as eſtabliſhed among the Perſians; and perhaps we may now be leſs ſuſpicious than before of Xenophon's veracity. It appears natural for a people who have reached that degree of civilization in which they are deſcribed, and have not yet advanced farther, to inſtitute ſuch an eſtabliſhment. Some ſuch eſtabliſhment alſo appears neceſſary to prevent the ſociety from falling back into their former barbarity. It will prevent their virtue and valour from decaying, though it may perhaps at the ſame time prevent them from making any very rapid progreſs in civilization and refinement. Yet the induſtry, the valour, the integrity, and the patriotiſm which it inſpires, muſt neceſſarily produce ſome favourable change in their circumſtances; and that change in their circumſtances will be followed by a change in their ſyſtem of education.

Amo Cre

The Cretans, too, the wiſdom of whoſe laws is ſo much celebrated in the records of antiquity, had a public eſtabliſhment for the education of their youth. Minos, whom they revered as their great legiſlator, was alſo the founder of that eſtabliſhment. Its tendency was ſimilar to that of the courſe of education purſued among the Perſians,—to form the ſoldier and the citizen. We cannot preſent our readers with a very particular or accurate account of it; but ſuch as we have been able to procure from the beſt authorities we think it our duty to lay before them.

The Cretans were divided into three claſſes; the boys, the youth, and the adults. Between ſeven and ſeventeen years of age, the boy was employed in learning to ſhoot the bow, and in acquiring the knowledge of his duties as a man and a citizen, by liſtening to the converſation of the old men in the public halls, and obſerving their conduct. At the age of ſeven, he was conducted to the public halls to enter on this courſe of education. He was taught to expoſe himſelf boldly to danger and fatigue; to aſpire after ſkill and dexterity in the uſe of arms and in the gymnaſtic exerciſes; to repeat the laws and hymns in honour of the gods. At the age of ſeventeen he was enrolled among the youth. Here his education was ſtill continued on the ſame plan. He was to exerciſe himſelf among his equals in hunting, wreſtling, and the military exerciſes; and while thus engaged, his ſpirits were rouſed and animated by ſtrains of martial muſic played on ſuch inſtruments as were then in uſe among the inhabitants of Crete. One part of the education of the Cretan youth, in which they were particularly deſirous to excel, was the Pyrrhic dance; which was the invention of a Cretan, and conſiſted of various military evolutions performed to the ſound of inſtruments.

Such were the principles and arts in which the Cretan legiſlature directed the youth to be inſtructed. This courſe of education could not be directed or ſuperintended by the parent. It was public, and carried on with a view to fit the boy for diſcharging the duties of a citizen when he ſhould attain to manhood.

3 earks on Cretan ation. It is eaſy to ſee, that ſuch a ſyſtem of education muſt have been inſtituted in the infancy of ſociety, before many arts had been invented, or the diſtinctions of rank had ariſen; at a time when men ſubſiſted in a conſiderable degree by hunting, and when the intercourſe of nations was on ſuch a footing, that war, inſtead of being occaſional, was the great buſineſs of life. Such a ſyſtem of life would then naturally take place even though no ſage legiſlator had ariſen to regulate and enforce it.

14 ng the demo- s. Lycurgus, the celebrated lawgiver of Lacedemon, thought it neceſſary to direct the education of youth in a particular manner, in order to prepare them for paying a ſtrict obedience to his laws. He regarded children as belonging more properly to the ſtate than to their parents, and wiſhed that patriotiſm ſhould be ſtill more carefully cheriſhed in their breaſts than filial affection. The ſpirit of his ſyſtem of education was pretty ſimilar to that of thoſe which we have juſt viewed as ſubſiſting among the Perſians and the Cretans.

As ſoon as a boy was born, he was ſubmitted to the inſpection of the elders of that tribe to which his parents belonged. If he was well ſhaped, ſtrong, and vigorous, they directed him to be brought up, and aſſigned a certain portion of land for his maintenance. If he was deformed, weak, and ſickly, they condemned him to be expoſed, as not being likely ever to become an uſeful citizen. If the boy appeared worthy of being brought up, he was entruſted to the care of his parents till he attained the age of ſeven years; but his parents were ſtrictly charged not to ſpoil either his mind or his bodily conſtitution by fooliſh tenderneſs. Probably, too, the ſtate of their manners was at that time ſuch as not to render the injunction peculiarly neceſſary.

At the age of ſeven, however, he was introduced to a public claſs, conſiſting of all the boys of the ſame age. Their education was committed to maſters appointed by the ſtate; and what was chiefly inculcated on them in the courſe of it, was ſubmiſſive obedience and reſpect to their ſuperiors; quickneſs and brevity in their converſation, and replies to ſuch queſtions as were put to them; dexterity and addreſs in performing what was commanded them, and firmneſs and patience in bearing every pain or hardſhip to which they might be expoſed. One of the means uſed to form them to habits of activity and addreſs, was to permit, nay, to direct them to commit little acts of theft; which, if they performed them ſo dexterouſly as to avoid detection, they might afterwards boaſt of as noble exploits: but if detected in ſuch enterpriſes, the aukward artleſs boy was expoſed both to puniſhment and diſgrace. To avoid the puniſhment and diſgrace incurred by being detected in an act of theft, the Spartan boy would often ſuffer with unſhrinking fortitude the ſevereſt torments. It is related of one of them, that rather than be diſcovered with a young fox under his cloak, which he had ſtolen, he ſuffered the little animal to tear open his bowels. Not content with beholding the children ſuffer by ſubmitting voluntarily to ſuch hardſhips, the Spartans alſo endeavoured to form them to fortitude, by whipping them on their religious feſtivals, ſometimes with ſuch ſeverity that they expired under the laſh. The Lacedemonian youth were alſo taught ſuch bodily exerciſes, and the uſe of ſuch warlike weapons, as were neceſſary to render them expert and ſkilful ſoldiers.

15 Remarks. They too, as well as the Cretans and Perſians, among whom we have ſeen that ſomewhat ſimilar modes of education prevailed, were to be citizens and ſoldiers; not huſbandmen, mechanics, artiſts, merchants, &c. Therefore the mode of education eſtabliſhed among them was ſimple and uniform. Its aim was, to make them acquainted with the nature of their ſocial duties, and to form them to ſuch vigour of body and ſuch firmneſs of mind as might render them fit for the ſtation in which they were to be placed, and adequate to the part which they were to act. This eſtabliſhment for education was perfectly conſiſtent with the other parts of that legiſlature which was inſtituted by Lycurgus. Youth educated among the Lacedemonias could hardly fail to become worthy members of that ſingular republic. Let us not however regard the Spartans as *ſingularly* inhumane in their treatment of youth. Let us reaſcend, in imagination, to that period in the progreſs of ſociety from rudeneſs to refinement, to which they had attained when Lycurgus aroſe among them. What were then their circumſtances, their arts and manners, their moral principles, and military diſcipline? Not very different from thoſe which the laws of Lycurgus rendered ſo long ſtationary among them. He, no doubt, rectified ſome abuſes, and introduced greater order and equality. But man is not to be ſo eaſily metamorphoſed into a new form. As you cannot, at once, raiſe an acorn to a venerable oak; ſo neither will you be able to change the ſavage, at once, into the citizen. All the art or wiſdom of Lycurgus, even though aſſiſted by all the influence of the prophetic Apollo, could never have eſtabliſhed his laws among his countrymen, had not their character and circumſtances previouſly diſpoſed them to receive them. But, grant this, and you muſt, of conſequence, allow, that what to us may appear cruel and inhumane, muſt have affected their feelings in a different manner. The change introduced in the treatment of youth by the eſtabliſh-

ment of this ſyſtem of education was probably recommended by its being more humane than what before prevailed. Corrupted as are our manners, and effeminate our modes of education; yet we would not perhaps act wiſely in laying them aſide, to adopt in their ſtead thoſe of ancient Sparta. But the Spartan education was peculiarly well fitted to form citizens for the republic of Lycurgus; it was happily adapted to that ſtate of ſociety in which it was introduced. And, if we ſhould enquire by what means Lycurgus was enabled to fix the arts, the manners, and in ſhort the civilization of his country, for ſo long a period in a ſtationary ſtate; we would perhaps find reaſon to aſcribe that effect, to the public eſtabliſhment which he inſtituted for the education of youth; to his confining the Spartan citizens to the profeſſion of arms, and aſſigning all ſervile offices to the Helots; and to his prohibiting the uſe of gold and ſilver. Among theſe however his eſtabliſhment for education occupies the chief place. Never was any ſtate adorned with more patriotic citizens than thoſe of Sparta. With them every private affection ſeemed to be ſwallowed up by the *amor patriæ:* the love of their country was at leaſt their ruling paſſion. Pœdaretes being rejected when he offered himſelf a candidate for a ſeat among the council of three hundred, returned home, rejoicing that there were in Sparta no fewer than three hundred whom his countrymen found reaſon to regard as better citizens than himſelf. This was not a ſeeming joy, aſſumed to conceal the pain which he ſuffered from the diſappointment; it was heartfelt and ſincere. Such were the effects of their ſyſtem of education.

16
Education among the other nations of antiquity.

When we turn our eyes from the Perſians, the Cretans, and the Spartans, to the other nations of antiquity; we no where behold ſo regular a ſyſtem of public education. Among the Athenians and the Romans, the laws did not deſcend to regulate in ſo particular a manner the management of the youth These nations gradually emerged from a ſtate of the rudeſt barbarity, to that poliſhed, enlightened, and civilized ſtate which rendered them the glory and the wonder of the heathen world: but in no part of their progreſs from the one ſtate to the other do we find any ſuch eſtabliſhment ſubſiſting among them. So various, however, are the circumſtances which form and diverſify the character of nations, that we cannot reaſonably conclude, becauſe no ſuch eſtabliſhments exiſted among the Athenians and Romans, that therefore their exiſtence was unnatural among thoſe nations who poſſeſſed them. But though the education of youth was managed in a different manner among theſe and moſt other nations in the ancient world, than by public eſtabliſhments, which detached children from the care of their parents; yet ſtill it was every where regarded as an object of the higheſt importance. As the manners of mankind gradually improved to a ſtate of refinement; as the invention of arts, and the diſcovery of ſcience gradually introduced opulence and luxury; connubial, parental, and filial affection gradually acquired greater ſtrength and tenderneſs. Of conſequence, children experienced more of their parents care; and that care was directed to form them for acting a becoming part in life. According to the circumſtances of each nation, the arts which they cultivated, and the form of government under which they lived; the knowledge which they ſought to communicate to their children, and the habits which they endeavoured to impreſs upon them, were different from thoſe of other nations: And again, according to the different circumſtances, tempers, abilities. and diſpoſitions of parents, even the children of each family were brought up in a manner different from that in which thoſe of other families were managed. The Athenians, the Romans, the Carthaginians, conducted each of them the education of their youth in a different manner, becauſe they had each different objects in view. But having conſidered the moſt ſingular eſtabliſhments for education which prevailed in the ancient world, it ſeems unneceſſary for us to deſcend to a particular account of the manner which every nation, or fantaſtic individual, thought proper to purſue in bringing up their youth. It will probably be more uſeful and entertaining to our readers, if we next preſent them with a view of ſome of the moſt judicious or fanciful plans of education which have been propoſed by the writers on that ſubject.

17
Quinctilian.

One of the moſt reſpectable writers on education among the ancients, is the celebrated Quinctilian. He taught rhetoric in Rome during the reign of Domitian and under ſeveral of the other emperors. When he retired from the exerciſe of his employment as a teacher of rhetoric, he ſpent his leiſure in the compoſition of a treatiſe, not merely on rhetoric, but on the moſt proper means for educating a boy ſo as to render him both an eloquent orator and a good man.

In that valuable treatiſe, he enters into a minute detail of all that appears to him moſt likely to conduce to thoſe important ends.

As ſoon as the boy enters the world, he would have the greateſt care to be uſed in ſelecting thoſe who are to be placed about him. Let his nurſe have no impediment of ſpeech. It will be happy for him, if his parents be perſons of ſenſe and learning. Let his tutor, at leaſt, poſſeſs theſe qualifications. As ſoon as he attains the diſtinct uſe of his organs of ſpeech, let him be initiated in the firſt elements of literature. For as he is capable of diſtinguiſhing and remembering at a vety early age; ſo his faculties cannot poſſibly be employed in a more advantageous manner. And even at this early period of life, let maxims of prudence and the firſt principles of morals be inculcated upon his mind by the books which are put into his hands, and even by the lines which he copies in learning the art of writing. The Greek language was to the Romans in the days of Quinctilian, what the Latin and Greek and French are to us at preſent, an acquiſition held indiſpenſably neceſſary to thoſe who aſpired to a liberal education; and Quinctilian judges it proper that the boy ſhould begin his application to letters with the Greek language in preference to his mother tongue.

This judicious writer next examines a queſtion which has been often agitated, Whether a domeſtic or a public education is liable to the feweſt inconveniences, and likely to be attended with the greateſt advantages? And he is of opinion, that in a domeſtic education the boy is in danger of being corrupted by injudicious fondneſs and evil example; is not rouſed by the ſpur of emulation; and is deprived of proper oppurtunities for acquiring a juſt idea of his own powers, or that ac-

activity and dexterity which he will afterwards find ſo neceſſary when he comes to act a part in life: While in a public education, which was preferred by ſome of the moſt renowned nations of antiquity, the morals are not greatly expoſed to corruption, emulation is rouſed, friendſhips are formed, all the powers of the mind are called forth to act with new vigour, and the youth is prepared for performing his part on the great theatre of the world. Quinctilian, therefore, wiſhes that parents would place their children in public ſeminaries of education.

When a boy is committed to a maſter's care, the maſter's attention muſt be firſt directed to diſcover his diſpoſitions and the extent of his capacity. Of his capacity he will form a favourable judgment, not from his ſprightlineſs, nor even from his quickneſs of apprehenſion; but from his modeſty, docility, and virtuous diſpoſitions. If the boy poſſeſs theſe laſt qualifications, the maſter will rejoice in him, as likely to give him ſatisfaction and do him honour. According to his temper and diſpoſitions, let the boy be treated with mildneſs or ſeverity; but never let ſeverity extend to blows. Let the boy be allured and led, by the moſt artful and inſinuating treatment, to do his duty; there will then be no occaſion to puniſh him for neglecting it.

As Quinctilian's profeſſed object was, not merely to give general directions for forming the heart and cultivating the underſtanding, but to form a particular character in life, the ſcholar and the orator; he finds it neceſſary to enter into minute details concerning the manner in which the boy is to be inſtructed in ſpeaking, writing, grammar, and compoſition; of which it does not appear neceſſary for us to take particular notice in this place. Muſic and geometry, he thinks, ought to make a part of the young orator's ſtudies; as being uſeful to render him accurate in reaſoning, and capable of reliſhing the beauties of the poets. He is alſo of opinion, that the boy ſhould not be confined to one branch of ſtudy, without being allowed to attempt others till he have made himſelf maſter of that. Let ſeveral parts of literature engage his attention by turns: let him dedicate a conſiderable portion of his time to them. He may thus acquire habits of induſtrious application which will remain with him through life.

With the tender attention of a good man, this ſenſible and elegant writer ſtill accompanies his pupil through the courſe of his ſtudies; anxiouſly inſiſts that he be placed under a maſter diſtinguiſhed for purity of morals, and for no mean abilities in his profeſſion; directs his memory to be ſtored with the nobleſt paſſages of the poets, orators, and hiſtorians; and carefully diſcuſſes and refutes thoſe opinions which repreſent genius as above induſtry. The remaining part of his work being employed on the principles of rhetoric, without containing any thing on the ſubject of education in general, it is not neceſſary that we ſhould here preſent an analyſis of it to our readers. But ſince Quinctilian was ſo diſtinguiſhed, not only as a rhetorician, but as an inſtructor of youth, and diſplays ſo much good ſenſe and ſo ſolid a judgment, formed on long experience, in whatever he advances on the ſubject of education; we could not, without extreme negligence, omit taking notice of him under this article, and affording our readers an opportunity of being inſtructed by liſtening to his ſentiments on this head.

18
Milton's treatiſe on education.

The name of John Milton is ſo much revered in Britain, that his ſentiments on any ſubject are intereſting to Britons. His life was dedicated to ſtudy: During a part of it, he was employed in the taſk of inſtructing youth; and among his other works we find a treatiſe on education. He had himſelf been educated according to that plan which has long been eſtabliſhed in the Engliſh univerſities; but with that mode of education he was not ſatisfied. The object of his directions is chiefly to form the ſcholar. He conſidered himſelf as qualified to exhibit a model of "a better education, in extent and comprehenſion far more large, and yet of time far ſhorter, and of attainment far more certain, than any that had yet been in practice." The following is the ſubſtance of his treatiſe.

As the end of learning is to cultivate our underſtandings, and to rectify our diſpoſitions; therefore the deſign of our applying to the ſtudy of languages cannot be merely that we may commit to memory the words of which they conſiſt, or that we may acquire a knowledge of their analogy and ſtructure; but that we may enrich our minds with the treaſures of wiſdom which they contain. But in the preſent modes of education this deſign does not appear to be kept in view. The learner of Latin is burdened with rules, and themes, and verſes, and orations; but no care is taken to make him maſter of the valuable knowledge which the claſſics contain. And when he advances a little farther, he is driven into the thorny paths of logic and metaphyſics. So, when his ſtudies are completed, and he is conſidered as having received a liberal education, he is almoſt as deſtitute of real knowledge as when he firſt entered a ſchool.

But to render learning truly beneficial, inſtead of the ſchool and univerſity education which youth at preſent receive; let the place of both ſchool and univerſity be ſupplied by an academy, in which they may acquire all that is taught at either, except law and phyſic. Let the academy afford accommodation for 150 perſons; 20 of whom may be ſervants and attendants. As many academies as are neceſſary may be afterwards erected on the model of this one. Let the youth who are introduced into this academy begin their ſtudies with learning the principal rules of grammar from ſome good elementary book. In their pronunciation of Latin, let them be taught to follow the pronunciation of the Italians; as that of the Engliſh is indiſtinct, and unſuitable to the genius of the language. Next, read to them ſome entertaining book on education; ſuch as, the three firſt books of Quinctilian in Latin, and Cebes, Plutarch, or ſome other of the Socratic diſcourſes, in Greek; and be careful to ſeize every opportunity of inſpiring them, by ſeaſonable lectures and explanations, with love for learning, admiration of great and virtuous characters, and a diſpoſition to cheerful obedience. At the ſame time, but at a different hour of the day, let them be inſtructed in the rules of arithmetic and the elements of geometry. Between ſupper and bed-time inſtruct them in the principles of religion and the ſacred hiſtory. From the writers on education let your pupils paſs to the authors on agriculture, to Cato, Varro, and Columella. Be-

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fore half theſe authors be read, they cannot but be pretty well qualified to read moſt of the proſe authors in the Latin language; and they may now, with great propriety, learn the uſe of the globes, and make themſelves acquainted with the ancient and modern maps. Let them, about the ſame time, begin the ſtudy of the Greek tongue, and proceed in it as in the Latin: they will not fail to overcome, in a ſhort time, all the difficulties of grammar; after which they will have acceſs to all the treaſures of natural knowledge to be found in Ariſtotle and Theophraſtus. In the ſame manner they may make themſelves acquainted with Vitruvius, Seneca, Mela, Celſus, Pliny, and Solinus. And having thus paſſed through the principles of arithmetic, geometry, aſtronomy, and geography, with a general compact of phyſics; let them next turn their attention to mathematics, in which they may begin with the practical branch of trigonometry, which will ſerve as an introduction to fortification, architecture, and navigation. To teach them the knowledge of nature, and inſtruct them in the arts of life, let them have the aſſiſtance and inſtructions, not merely of maſters who are acquainted only with books, but of men whoſe ſkill has been obtained by actual practice, even of artiſts and mechanics. Next, let the poets obtain their attention; and they will now read them with eaſe and pleaſure. From the poets let your pupils proceed to the moraliſts; and, after acquainting themſelves with them, they may be allowed the entertainment of ſome of the beſt Greek, Latin, and Italian, dramatic compoſitions. From theſe let them proceed to politics: let them here ſtudy the law of Moſes, the admirable remains of the ancient lawgivers of Greece, the Roman tables, edicts, and pandects, concluding with the inſtitutions of their mother country. Now let them be more particularly inſtructed in the principles of theology; for by this time they may have acquired the Hebrew language, together with the Chaldee and the Syriac dialect, and may therefore read the ſcriptures in their original language. When their minds are thus furniſhed, they will be able to enter into the ſpirit of the nobleſt hiſtorians and poets. To get by heart, and repeat in a proper manner, paſſages from the writings of ſome of theſe, will have the happieſt effects in elevating their genius. Let this ſtately edifice be crowned with logic and rhetoric. Far different would be the effects of ſuch a courſe of education, from thoſe produced by any which is at preſent purſued. We ſhould then ſee abler writers, more eloquent ſpeakers, and wiſer ſtateſmen. Similar to this, probably, was the courſe taught in the famous ſchools of Pythagoras, Plato, Iſocrates, and Ariſtotle. This would unite the advantages of an Athenian and a Spartan education: for our pupils ſhould be taught the exerciſes of wreſtling and fencing, and the whole military diſcipline.

19
Remarks.

Such are the ideas of our admired Milton on the ſubject of education. An enthuſiaſtic admirer of the ſciences, arts, and inſtitutions of Greece and Rome; from his religious and political principles, no friend to the univerſities; it was natural for a man of his learning and ingenuity, in an age of innovation, and influenced by ſuch prejudices, to form ſuch a project as that which we have ſurveyed. He ſeems not to have reflected, that it is neceſſary for children to be long occupied in obtaining a familiar acquaintance with words, before they can gain from books any knowledge of things; overlooking this circumſtance, and perceiving plainly that the mode of education which then prevailed confined the attention of youth almoſt wholly to words, he could not but regard the ſcheme which he propoſed as likely to produce very happy effects. His obſervation, that the appearances of external nature are among the firſt objects which attract the attention of youth, which he communicates by directing his pupils to peruſe the writers on agriculture and natural hiſtory as near the beginning of their ſtudies as poſſible; if not altogether juſt, yet muſt be allowed to be nearly ſo. Perhaps human actions and paſſions, and the ſeries of events which happen around us, are, by the time at which we begin our application to learning, the objects which moſt frequently and ſtrongly engage our attention: But the appearances of external nature are at leaſt the next object of our regard.

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Mr Locke, to whoſe abilities and noble deſire to be uſeful to the world his country is ſo much indebted, has written, among other things, on the education of youth. He was capable of thinking for himſelf; but more deſirous of rendering himſelf uſeful, than of being admired for ſingularity. He is, therefore, an author to whom we ought to liſten, at leaſt, with reſpectful attention. If Quinctilian and Milton had been employed as teachers of youth, Mr Locke had been converſant with the world, had inquired into the principles of human nature, and had no doubt endeavoured to examine without prejudice the effects of thoſe modes of education of which he diſapproves. When we conſider, that, to render himſelf uſeful to the riſing generation, he could deſcend from the heights of ſcience to tranſlate the fables of Æſop, and to perform other humble taſks in literature, which a philoſopher of leſs benevolence and virtue would have diſdained; we cannot but look with veneration and gratitude on ſo exalted a character. In his Treatiſe on Education, the two great objects which Mr Locke keeps in view are, 1ſt, To preſerve and ſtrengthen the bodily conſtitution; 2dly, To inform the underſtanding with uſeful knowledge, and to cheriſh good diſpoſitions in the heart.

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In his directions on the firſt of theſe heads, he ſeems extremely anxious to prevent parents and others in whoſe hands children are placed, from injuring them by ill-directed tenderneſs. Plain fare, ſimple and light cloathing, abſtinence from phyſic and from ſtrong liquors, he earneſtly recommends as the moſt judicious means for preſerving and confirming the health of the child. In all his gratifications let the ſtricteſt moderation be obſerved. If you permit him to indulge pretty freely in ſleep, at leaſt cauſe him to get up at an early hour in the morning. In one thing, however, few parents will be willing to comply with Mr Locke's advice. He not only directs that the child's feet be frequently bathed in cold water; but even expreſſes a wiſh, that his ſhoes were always kept in ſuch a condition as to admit water freely. This he thinks likely to fortify the conſtitution of the body in ſuch a manner, as to render him leſs liable, in the courſe of life, to ſuch diſeaſes as ariſe from any unuſual expoſure to wetneſs or cold, than others whoſe feet have been more carefully kept dry. Though he had proſecuted his ſtudies with a deſign to enter into the profeſſion of phyſic, yet ſo unfavourable an opinion did he entertain of the effects produced by medical preparations on the human conſtitution, that he earneſtly inſiſts on the parent to beware of adminiſtering any of them to his child. From the deſire which Mr Locke diſcovers to have children expoſed to hardſhips, and reſtrained from indulgence, in order to confirm the health and invigorate the conſtitution, we may conjecture him to have been an admirer of that ſevere mode of education which uſually prevails in the earlier periods of the exiſtence of ſociety. He ſeems to have thought, that if a boy be brought up like a Huron or a Spartan, he muſt neceſſarily become robuſt and healthy; without reflecting, that of thoſe children who are ſubjected to ſuch a courſe of education, too great a proportion are unable to ſurvive it: ſuch is the natural delicacy of the human frame.

When he turns his attention to the cultivating of the underſtanding, and the forming of the diſpoſitions, Mr Locke ſtill deſervedly claims the regard of the parent and the preceptor. With a virtuous indignation he reprobates that negligence and folly by which we generally corrupt the heart and ſpoil the temper of children, even in the period of infancy; ſo as to render them incorrigible when they advance farther in life. Their appetites are pampered, all their deſires are gratified; and if we are at any time diſpoſed to refuſe what they aſk, they have an all-powerful engine to compel our compliance with their wiſhes. They aſſail us with tears; and we then yield to their requeſts, however hurtful to themſelves or inconvenient to us. We often ſtudiouſly inſtruct them in vicious tricks, and call forth their evil paſſions. At ſo early an age, their rage or cunning can ſcarcely injure us; and we reflect not that habits of peeviſhneſs and deceit muſt be peculiarly hurtful to themſelves.

But though all the fooliſh deſires of children ought not to be gratified, and though we ſhould carefully avoid leading them into any bad habit; yet it is not neceſſary nor prudent to treat them with harſhneſs or ſeverity. Let them be formed to obedience from their earlieſt years: let them be accuſtomed to ſubmit implicitly to the direction of thoſe on whom they depend. But beware of ſouring their temper and depreſſing their ſpirits by harſhneſs: and on the other hand, remember, that it is no leſs improper to give the boy a habit of neglecting his duty except when he is allured to it by the hopes of reward. As he advances towards manhood, and attains the uſe of reaſon; you may admit him to greater familiarity, and allow him to follow his own inclinations more than at an earlier period: and if, inſtead of indulging all his freaks in childhood, you have carefully accuſtomed him to obedience and ſubmiſſion, without enforcing theſe by improper means, he will now be able to regulate his conduct with ſome degree of prudence.

But while caution is to be uſed in beſtowing rewards and inflicting puniſhments; ſtill rewards and puniſhments are indiſpenſably neceſſary in the management of the child. Inſpire your boy with a ſenſe of ſhame, and with a generous thirſt for praiſe. Careſs and honour him when he does well; treat him with neglect when he acts amiſs. This conduct will produce much better effects than if you were at one time to chide and beat him; at another, to reward him with a profuſion of ſweetmeats and playthings.

Think not that children are to be taught propriety of conduct by loading their memory with rules, directing them how to act on every particular occaſion. Burden them not with rules, but impreſs them with habits.

Be not deſirous of forming them at too early an age, to all that politeneſs and propriety of manners which you wiſh to diſtinguiſh them when they become men. Let them be taught an eaſy, graceful carriage of body: but give yourſelf no concern, though they now and then blunder againſt the punctilios of good-breeding; time will correct their aukwardneſs.

With regard to that important queſtion, whether children ought to be ſent to a public ſchool, or are likely to be better trained up in a domeſtic education? ſo impoſſible is it for one maſter to extend his attention to a number of boys, and ſo likely is the contagion of vice to be caught among the crowd of a public ſchool, that a private ſeems more favourable than a public education to virtue, and ſcarce leſs favourable to learning.

When you reſolve to give your ſon a domeſtic education, be careful to regulate that domeſtic education in a judicious manner. Keep him at a diſtance from evil example: chooſe the moſt favourable ſeaſons for communicating inſtruction: ſtrictly enforce obedience; but never by blows, except in caſe of obſtinacy which you find otherwiſe incurable. If his engagements in life prevent the parent from ſuperintending and directing his ſon's education perſonally, let him commit him to the care of a virtuous and judicious tutor. Let the tutor be rather a man of experience in the world than of profound learning; for it is more neceſſary that the pupil be formed for conducting himſelf with prudence in the world, and be fortified againſt thoſe temptations to which he will be expoſed when he enters upon active life, than that his head be ſtuffed with Latin and logic.

Here Mr Locke, notwithſtanding that his own mind was ſtored with the treaſures of Grecian and Roman literature, takes occaſion to declare himſelf pretty freely againſt that application to ancient learning, which was then indiſpenſably required in the education of youth. He conſiders languages and philoſophy as rather having a tendency to render the youth unfit for acting a prudent and becoming part in life, than forming for it: and he therefore inſiſts that theſe ſhould be but in a ſubordinate degree the objects of his attention.

Let the tutor encourage the child under his care to a certain degree of familiarity; let the pupil be accuſtomed to give his opinon on matters relative to himſelf: let him be taught juſtice, by finding injuſtice to others prejudicial to himſelf; let him be taught liberality, by finding it advantageous; let him be rendered ſuperior to teazing his parents or tutor with complaints, by finding his complaints unfavourably received. That you may teach him to reſtrain every fooliſh or irregular deſire, be ſure never to indulge his wiſhes, ſave when you find the indulgence proper for him, and convenient for yourſelf. Curioſity, however, is a principle which ought to be induſtriouſly rouſed in the breaſt of the child, and cheriſhed there by meeting always the readieſt gratification. However you may oppoſe the boy's inclinations in other things, yet refuſe him not a proper portion of recreation: let him indulge in play, while he continues to play with keenneſs and activity; but ſuffer him not to loiter about in liſtleſs indolence. To reſtrain your child from fool-hardy courage, point out to him the dangers to which it expoſes him: to raiſe him above timorous cowardice, and inſpire him with manly fortitude; accuſtom him from the earlieſt period of life to an acquaintance with ſuch things as he is moſt likely to be afraid of: ſubject him now and then to pain, and expoſe him to danger; but let ſuch trials be judiciouſly conducted.

Idleneſs or curioſity ſometimes leads children to cruelty in their treatment of ſuch animals as are placed within their power. Dogs, cats, birds, and butterflies, often ſuffer from their inhumanity. But when they ſeem inclined to ſuch cruelty, let them be carefully watched, and let every means be uſed to awake their hearts to generous ſenſibility. Allow them to keep tame birds, dogs, &c. only on condition of their uſing them with tenderneſs. Perhaps this unhappy diſpoſition to cruelty is occaſioned, or at leaſt foſtered, by people's laughing when they behold the impotent efforts of children to do miſchief; and often going ſo far as even to encourage them in maltreating thoſe creatures which are within their reach. We entertain them, too, with ſtories of fighting and battles; and repreſent characters diſtinguiſhed for atrocious acts of inhumanity as great and illuſtrious. But let ſuch practice be carefully refrained from, if you wiſh to inſpire your child with generous and humane ſentiments. Teach him gentleneſs and tenderneſs, not only to brute animals, but alſo to ſervants and companions.

Curioſity is to be rouſed and cheriſhed in the breaſt of the child: but by what means? Anſwer his inquiries readily: though his queſtions be put in aukward language, let not that hinder you from attending to the objects of them. Curioſity is natural to the human mind; and if you repreſs not the curioſity of the child, he will often be moved by its impulſe to the purſuit of knowledge. Let him find his eagerneſs in the purſuit of knowledge, a ſource of applauſe and eſteem. Avoid the folly of thoſe who ſport with the credulity of children, by anſwering their queſtions in a ludicrous or deceitful manner.

You muſt, however, not only liſten with obliging attention to his queſtions, and ſtrive to gratify his curioſity; but even whenever he attempts to reaſon on ſuch ſubjects as are offered to his obſervation, be careful to encourage him: praiſe him if he reaſons with any degree of plauſibility; even if he blunders, beware of ridiculing or laughing at him. With regard to the boy's play-things: while you indulge him freely in innocent diverſions. give him ſuch play-things as may be neceſſary in the amuſements in which he engages, provided they be ſuch as he cannot make himſelf; but it will be ſtill better for him to exerciſe his dexterity and ingenuity in making them himſelf.

After throwing out theſe things concerning the general principles on which education ſhould be carried on, Mr Locke next proceeds to thoſe particular parts of knowledge in which he thinks every young gentleman ought to be inſtructed. In virtue, wiſdom, breeding, and learning, he comprehends all that is neceſſary to enable his pupil to act a reſpectable part in life.

In forming the boy to virtue, the firſt thing to be done, is to inform him of the relation ſubſiſting between human creatures and a ſupreme independent Being, their creator, preſerver, and governor; and to teach him, that obedience and worſhip are due to that Being. But when you inform the child of the exiſtence of an inviſible Being, beware of impreſſing his mind with any notions concerning ſpirits or goblins, which may render him incapable of bearing darkneſs or ſolitude. In infancy our minds are, by the indiſcretion of thoſe about us, generally impreſſed with ſuch prejudices concerning a thouſand frightful forms, ever ready to aſſail or haunt us under the ſhade of night, that we become incapable of manly fortitude during the courſe of life: the ſoldier who will boldly face death in the field of battle, ſhall perhaps tremble and take to flight at the ruſtling of a few leaves, or the grunting of a hog in the dark. But were the imaginations of children not crazed with wild ſtories concerning ſpirits and hobgoblins, darkneſs would be no more alarming to them than light. After informing the child of the exiſtence of a Deity, and teaching him to pray to him; next labour to impreſs his mind with a veneration for truth, and habituate him to a ſtrict adherence to it on every occaſion. Endeavour alſo to render him gentle and good-natured.

The beſt means you can uſe to teach him wiſdom or prudence in conducting himſelf in the ordinary buſineſs and intercourſe of life, is to teach him to deſpiſe the mean ſhifts of cunning. The reſt muſt be learned by actual experience in life.

The decencies of life, comprehended under the word Good Breeding, form no inconſiderable part of a good education. In teaching theſe, two things are to be attended to: Inſpire the youth with a diſpoſition to pleaſe and oblige all with whom he is converſant; next, teach him how to expreſs that diſpoſition in a becoming manner. Let boiſterous roughneſs, haughty contempt of others, cenſoriouſneſs, impertinent raillery, and a ſpirit of contradiction, be baniſhed from his temper and behaviour. At the ſame time, beware of leading him to regard the mere forms of intercourſe as a matter of the higheſt importance. Remember that genuine good-breeding is only an eaſy and graceful way of expreſſing good ſenſe and benevolence in his converſation and deportment.

Mr Locke, when he comes to give his opinion concerning thoſe parts of learning which are proper to be taught a young gentleman, and the manner in which they ought to be communicated, adviſes to initiate the child in the art of reading, without letting him know that he is engaged about a matter of any importance, or learning an accompliſhment which you are ſolicitous that he ſhould acquire. Preſent it to him in the form of an amuſement, or teach him to conſider it as an high honour to be permitted to learn his alphabet; otherwiſe he will turn from it with diſguſt. When by inſinuating arts you have allured him to apply to reading, put into his hands ſuch books as are plain, entertaining, and inſtructive. Inſiſt not on his reading over the bible: inſtead of gaining any advantage from an indiſcriminate

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peruſal of it at this period of life, he is likely to acquire the moſt confuſed notions of religion, and an indifference for the ſacred volume during the reſt of life; yet it may be highly proper to cauſe him to peruſe ſome of its beautiful hiſtorical paſſages, and to familiarize him with its elegant and ſimple moral precepts. After learning to read his mother-tongue, the boy's attention ought to be next directed to the art of writing. The eaſieſt way to teach him that art, is to get a plate engraved, after the model of any hand which you think moſt proper for his imitation. With this plate get a number of copies caſt with red ink; the letters of theſe the learner may trace with his pen filled with black ink: and he will thus in a ſhort time, and without much trouble to you or himſelf, acquire a decent hand. As drawing is uſeful on many occaſions in life; if the boy be not naturally incapable of acquiring it, he may with great propriety dedicate ſome part of his time and attention to that art.

When the ſcholar has attained a tolerable degree of ſkill in writing, and in reading and ſpeaking his native language, he muſt next begin an acquaintance with other languages. Among theſe, the firſt object of his ſtudy will naturally be the Latin. Yet let none waſte their time in attempting to acquire a knowledge of Latin, but ſuch as are deſigned for ſome of the learned profeſſions, or for the life of a gentleman without a profeſſion. To theſe laſt it may be uſeful; to others it is wholly unſerviceable. But in learning the Latin tongue, a much happier method than burdening and perplexing him with rules of grammar, would be to make him ſpeak it with a tutor who were ſufficiently maſter of it for that purpoſe. Thus might he ſpend that time which is uſually occupied in acquiring this language, in learning ſome other neceſſary branches of education. But if you cannot conveniently have the boy taught the language by the way of converſation, let the introductory books be accompanied with an Engliſh verſion, which he may have eaſy recourſe to for the explanation of the Latin. Never perplex him with grammatical difficulties. Reflect that, at his age, it is impoſſible to enter into the ſpirit of thoſe things. Render every thing as eaſy and pleaſing as poſſible; for the attention will not fail to wander, even though you labour not to render the taſk diſagreeable. Skill in grammar may be uſeful; but it is to thoſe whoſe lives are to be dedicated to the ſtudy of the dead languages: that knowledge which the gentleman and the man of the world may have occaſion to derive from the treaſures contained in the ancient languages, may be acquired without a painful ſtudy of proſody or ſyntax. As the learning of any language is merely learning words; if poſſible, let it be accompanied with the acquiſition of ſome real knowledge of things; ſuch as the nature of plants, animals, &c. their growth and propagation. But if you cannot or will not give your boy a private education, and are ſtill reſolved to ſend him to ſchool, to be whipped through the uſual courſe of Greek and Latin; at leaſt act with ſo much good ſenſe and humanity, as to inſiſt that he be not burdened and tormented with the compoſition of Latin themes and verſes. Neither let his memory be oppreſſed with whole pages and chapters from the claſſics. Such ridiculous exerciſes have no tendency, whatever prejudice may urge to the contrary, to improve him either in the knowledge of languages or of nature.

Mr Locke ſeems to wiſh that the French language, which in his days had attained to higher refinement and a more regular analogy than any of the other modern languages of Europe;—he ſeems to wiſh that the French were learned along with the Latin: and he wiſhes the ſtudy of theſe languages to be accompanied with the ſtudy of arithmetic, geography, hiſtory, and chronology. Let theſe branches of knowledge be communicated to the learner in one of the two languages; and he will thus acquire the language with greater facility. He next points out the advantages of the branches of knowledge which he recommends as proper to be learned together with the languages; but on that head he ſays nothing ſingular. One method which he recommends for facilitating the ſtudy of language is, to put into the youth's hands, as ſoon as he has acquired a tolerable knowledge of chronology, ſome of the moſt entertaining Latin hiſtorians: the intereſting nature of the events which they relate will not fail to command his attention, in ſpite of the difficulty which he muſt find in making out their meaning. The Bible and Tully's Offices will be his beſt guides in the ſtudy of ethics. The law of nature and nations, as well as the civil and political inſtitutions of his country, will form to him an important object, which he ought to ſtudy with the moſt careful attention. Rhetoric and logic, though generally regarded as objects of great importance in a liberal education, can neither of them contribute much, with all their rules and terms, to render him an acute reaſoner or an eloquent ſpeaker; and it is therefore unneceſſary for him to honour them with very particular attention. Tully and Chillingworth will be more beneficial in teaching him to reaſon and to perſuade, than all the treatiſes on rhetoric and logic which he can poſſibly peruſe, or all the lectures on thoſe arts which he can gain opportunities to hear. In every art and every ſcience, practice and experience are infinitely better than rules. Natural philoſophy, as contributing to inſpire the breaſt with warmer ſentiments of devotion, and ſerving alſo to many uſeful purpoſes in life, ought to make a part in the young gentleman's ſtudies. But the humble experimental writers on that ſubject are to be put into his hands in preference to the lofty builders of ſyſtems. As for Greek, our pupil is not to be a profeſſed ſcholar, but a gentleman and a man of the world; and therefore it does not appear neceſſary that Greek ſhould make a part in the ſyſtem of his education. But in none of theſe ſtudies will the pupil ever attain any proficiency, unleſs he be accuſtomed to method and regularity in the proſecution of them. In languages, let him gradually aſcend from what is ſimpleſt to what is moſt difficult: in hiſtory, let him follow the order of time; in philoſophy, that of nature.

Dancing, as contributing to eaſe and gracefulneſs of carriage, ought to make a part in our young gentleman's education. Fencing and riding being faſhionable, cannot well be denied him. As he is likely, in the courſe of life, to have ſome leiſure hours on his hands, and to be ſometimes diſpoſed to active recreation, let him learn ſome mechanical trade, with the exerciſe of which he may agreeably fill up ſome of thoſe hours. If he is to poſſeſs any property, let him not be unſkilled in the management of accounts. Travel, inſtead of being uſeful, appears more likely to be hurtful to the underſtanding and morals of the traveller, unleſs deferred to a later period than that at which young men are uſually ſent out to complete their education by traverſing through foreign countries.

Here Mr Locke concludes his work with obſerving, that he does not offer it to the world as a full or comprehenſive treatiſe on the ſubject of education; but merely as the outlines of what occurred to him as moſt proper to be obſerved in breeding up a young gentleman not intended for any learned profeſſion or mechanical employment, but for acting a reſpectable part in life at the head of a competent hereditary fortune.

23
Remarks.

In conſidering the ſentiments of this reſpectable philoſopher on the ſubject of education, we perceive, that as he was, on the one hand, ſuperior to thoſe prejudices which render us incapable of diſtinguiſhing the defects or abſurdities of any cuſtom or inſtitution which has long prevailed; ſo, on the other hand, he was free from that ſilly vanity which diſpoſes thoſe who are ſubject to its influence to affect novelty and ſingularity of ſentiment on every ſubject which they conſider. Though a member of one of the univerſities, he heſitates not to declare himſelf againſt a very laborious attention to claſſical learning; and his reaſoning is, through the whole of his treatiſe, rather plain and ſolid than ſubtle or refined.

Yet, however we reſpect the ſoundneſs of his underſtanding or the benevolence of his intentions, we cannot avoid obſerving, that his opinions are not always ſuch as experience juſtifies. He had no doubt taken notice of ſome inſtances in which the too great anxiety of parents about the preſervation of their children's health was the very means of rendering their conſtitution feeble and tender through the courſe of life; and from that circumſtance might be led to propoſe thoſe expedients which he mentions for preſerving the health and ſtrengthening the conſtitution of children. But a little more obſervation or inquiry would have eaſily convinced him, that ſome of his expedients, inſtead of ſtrengthening the child's conſtitution, would in all probability ſhorten his days.

He had perhaps ſeen ſome of the heroes of claſſical literature, who were familiar with Demoſthenes and Cicero, and had Homer and Virgil at their fingers ends,—he had ſeen ſome of thoſe gentlemen ſo overloaded with their cargo of Greek and Latin as to be unfit for the ordinary buſineſs and intercourſe of life; and ſuch inſtances might tempt him to forget the advantages which he himſelf, and a long ſeries of philoſophers, patriots, and ſtateſmen, with whoſe names the annals of our country are adorned, had derived from a regular claſſical education. But as we are afterwards to deliver our own ſentiments on this ſubject, we will not here extend our obſervations on Mr Locke to a greater length.

24
Rouſſeau

An author more diſtinguiſhed than Mr Locke, for tenderneſs of ſentiment, ſingularity, eloquence, and whim, has preſented the public with a work on the ſubject of education, in which he, with unexampled boldneſs, inveighs againſt all the eſtabliſhed modes, as well as reprobates whatever had been advanced by former writers on the ſubject; and, at the ſame time, delineates a plan of education which he would perſuade us is infinitely ſuperior to thoſe which he explodes. This writer is the amiable and pathetic Rouſſeau: And tho' he be often vain, paradoxical, and whimſical; yet the charm of genius and ſentiment which adorns his writings will at leaſt engage our attention while he unfolds his opinions.

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He ſets out with obſerving, that our buſineſs in the bringing up of children ſhould be, to ſecond and to call forth nature; and that, inſtead of this, we almoſt always oppoſe her intentions and operations. As ſoon as the child ſees the light, he is wrapped in ſwathing bands. His limbs are thus reſtrained from that free motion which is neceſſary to their growth and vigour; and even the internal parts of his frame are rendered incapable of their proper functions. Mothers are too proud or indolent, or too fond of gaiety and diſſipation, to ſubmit to the taſk of nurſing their own children. The poor infants are committed to ſome hireling nurſe, who not being attached to them by natural affection, treats them with negligence or inhumanity. But is that mother capable of any delicacy of ſentiment, who can permit another to ſuckle her child, and to ſhare with her, or perhaps wholly ſupplant her, in the filial affection of that child?

Again, when parents undertake the care of their infant children, they often injure them by miſtaken tenderneſs. They pamper them with delicate meats, cover them with warm clothes, and anxiouſly keep them at a diſtance from all that has the appearance of danger: not attending to the economy of nature, who ſubjects us in infancy to a long train of epidemical diſtempers, and expoſes us during the ſame period to innumerable dangers; the deſign of which doubtleſs is, to teach us a prudent concern for our own ſafety, and to ſtrengthen and confirm our conſtitutions.

A child no ſooner enters into life, than it begins to cry; and during a great part of infancy continues frequently to ſhed tears. We either attempt to ſoothe it into good nature, or ſeek to ſilence it by harſher means; and it is thus we infuſe into its infant mind thoſe evil paſſions which we afterwards preſume to impute to nature.

As the mother generally diſdains to nurſe her own child, ſo the father is ſeldom at leiſure to take any ſhare in the management of his education: he is put into the hands of a tutor. But that tutor whoſe time and attention can be purchaſed for money is unworthy of the charge. Either be yourſelf your ſon's preceptor, or gain a friend whoſe friendſhip to you ſhall be his ſole motive to undertake the taſk.

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After a few preliminary obſervations to the above purport, our author introduces his Emilius; in whoſe education he delineates that plan which he prefers. The preceptor whom he would aſſign Emilius muſt be young; and muſt dedicate his attention to Emilius alone, from the time when his pupil enters the world till he attain the full age of manhood. Emilius, to receive the full benefit of his preceptor's ſyſtem of education, and to afford full ſcope to it, muſt poſſeſs a genius of the middle claſs; no prodigy of parts, nor ſingularly dull; he muſt have been born to affluent circumſtances and an elevated rank in life. His preceptor is inveſted with the rights, and takes upon him the obligations, of both father and mother. Emilius is, when put into

into the hands of his preceptor, a well-ſhaped, vigorous, and healthy child The firſt care of the preceptor is to provide him with a nurſe, who, as he is new born, muſt be newly delivered : it is of ſtill higher importance that ſhe be clean, healthy, virtuous, and of mild diſpoſitions. While ſuckling her charge, ſhe ſhall feed plentifully, chiefly on a vegetable diet. The child muſt be frequently bathed, in cold water if poſſible ; if you begin with warm, however, uſe it by degrees colder and colder, till at length he is able to bear it entirely cold. He is not to be wrapped in ſwaddling-clothes or rollers, or bound with ſtay-bands ; but put in good warm blankets and in a roomy cradle : Let him ſtretch and move his limbs at freedom, and crawl about on hands and knees at his pleaſure. The greateſt care muſt now be taken to prevent the child from contracting any habits whatever : Suffer him not to uſe one arm more than another, or to eat or ſleep at ſtated hours. Prepare him for the enjoyment of liberty, by preſerving to him the exerciſe of his natural abilities, unfettered by any artificial habits.

As ſoon as the child begins to diſtinguiſh objects, let his education begin. Some objects are naturally agreeable, others frightful. Accuſtom him to look upon any object that may come in his way without being affrighted. Children are at firſt ignorant of local relations, and learn to diſtinguiſh them only by experience ; and while Emilius is yet an infant, incapable of ſpeaking or walking, he may be aſſiſted in acquiring the knowledge of theſe.

In his feeble helpleſs condition, the child muſt feel many wants and much uneaſineſs ; tears are the language which nature has given him to make known his diſtreſſes and wants. When the child cries, it would be much more prudent and humane to examine what he ſuffers or ſtands in need of, than, as is uſually done, to rock or ſing him aſleep ; or, when theſe means ſucceed not, to threaten or uſe him brutally.

In managing children, as nature has endowed them with no ſuperfluous powers, we ought not to confine them from the free uſe of thoſe which they are able to exert. It is our duty to ſupply their deficiency both of mental and bodily powers ; but while we are ready to adminiſter on every occaſion to their real wants, we muſt beware of gratifying their caprice or unreaſonable humours. In order to diſtinguiſh between their natural and fantaſtic wants, we muſt ſtudy the language and ſigns by which they expreſs their wiſhes and emotions. Though crying be the means which nature has given infants to enable them to procure relief or aſſiſtance, yet when they cry they are not always in need of either. They often cry from obſtinacy or habits of peeviſhneſs. But if, inſtead of attempting to ſoothe them by diverting their attention to other objects, we would on ſuch occaſions entirely neglect them, they would ſoon ceaſe to indulge in ſuch fits of crying.

When children begin to ſpeak, we are uſually anxious about their language and articulation, and are every moment correcting their blunders. But inſtead of hoping to teach them purity or correctneſs of ſpeech by ſuch means as theſe, let us be careful to ſpeak eaſily and correctly before them, and allow them to expreſs themſelves in the beſt manner they can. By ſuch means we will be much more likely to obtain our wiſhes in this matter. When they ſpeak, let us not liſten with ſuch ſolicitude as to relieve them from the neceſſity of uſing an open diſtinct articulation.

When the child attains the power of expreſſing himſelf in artificial language, he may then be conſidered as having reached the ſecond period of infancy. He needs not now to make known his wants by tears, and ſhould therefore be diſcouraged from the uſe of them. Let his tears be entirely neglected. He now begins to run about, and you are anxious to prevent him from hurting himſelf ; but your anxiety can only render him peeviſh or timid. Remove him from any very alarming danger, and then ſuffer him to run about at his pleaſure. He will now and then bleed, and hurt himſelf ; but he will become bold, lively, and cheerful.

27
Subjection to authority.

In regulating the conduct of your child, let him know that he is dependant ; but require not of him an implicit ſubmiſſion to your will. Let his unreaſonable deſires be oppoſed only by his natural inability to gratify them, or by the inconveniences attending the gratification. When he aſks what is neceſſary or reaſonable, let him inſtantly obtain it ; when he aſks what is unreaſonable or improper, lend a deaf ear to all his intreaties and demands. Beware of teaching him to eſtabliſh his authority over you by means of the forms of politeneſs. A child will ſcarce take the trouble to addreſs you with *If you pleaſe*, unleſs he has been made to regard theſe as a ſet of magic ſyllables, by the uſe of which he may ſubject every perſon to his will. His *If you pleaſe* then means *I pleaſe ; pray*, with him, ſtands for *do*. Though you put in his mouth the words of humility, his tone and air are thoſe of authority that *will* be obeyed.

Sacrifice not the preſent happineſs of your child for the ſake of any diſtant advantage.

Be not too anxious to guard him againſt natural evil. The liberty which he enjoys while he is now and then permitted to expoſe himſelf to blows, or cold, or wetneſs, is more than a ſufficient compenſation for all that he thus ſuffers.

28
Ideas of moral obligation.

Seek not to impreſs him with ideas of *duty* or *obligation*. Till children reach the years of diſcretion, they are incapaple of any notions of the diſtinctions of morality. Avoid therefore even the uſe of the terms by which theſe are expreſſed in their hearing. While they continue to be affected only by ſenſible objects, ſeek not to extend their ideas beyond the ſphere of ſenſation. Try all the powers of language, uſe the plaineſt and moſt familiar methods you can contrive ; you ſhall ſtill be unable to give the boy at this age any juſt ideas of the diſtinction between right and wrong. He may readily conceive, that for one ſet of actions you will puniſh him, and that by another he will obtain your approbation ; but farther than this his ideas of *right* and *wrong*, of *virtue* and *vice*, cannot yet be carried.

The powers of the human mind are gradually unfolded. At firſt, the infant is capable only of perception ; by and by, his inſtincts and paſſions begin to exert their force ; at length, as he advances towards manhood, reaſon begins to act, and he becomes able to feel the beauty of virtue and the deformity of vice.

But though you ſeek not to regulate his conduct by by notions of *duty*, yet let him feel the yoke of neceſſity. Let him know, that as he is weaker than you, he muſt not, therefore, expect that you ſhould be ſubject to his will; and that, as he has neither ſkill nor ſtrength to control the laws of nature, and make every object around him bend to his pleaſure, he cannot hope to obtain the gratification of all his wiſhes. Thus you teach him virtue before he knows what virtue is; and call forth his reaſon without miſleading or perverting it. Let him feel his impotence; but forbid him not to think, that if he had power there would be no reaſon why he might not at pleaſure even turn the world upſide down.

Hitherto you have given your pupil no verbal inſtructions, nor muſt you yet attempt to inſtruct him by any other means than experience; let all his knowledge be literally of his own acquiſition.

Let not the parent who has obſerved the conduct of children brought up in the uſual way be afraid that, if his child ſhould be treated like our pupil, he would become ſtupid and vicious. Nature ſends not human beings into the world with a prediſpoſition to vice: we ſow the ſeeds of it in the infant heart; and by our abſurd modes of treatment, we alſo enfeeble and pervert the powers of the underſtanding.

But from the hour of his birth till he attain the age of twelve, the education of Emilius ſhall be purely negative. Could we but bring him up healthy and robuſt, and entirely ignorant, till that period, the eyes of his underſtanding would then be open to every leſſon: free from the influence of habit and prejudice, his paſſions would not then oppoſe us; and we might render him the wiſeſt and moſt virtuous of men. If we can but loſe time, if we can but advance without receiving any impreſſions whatever, our gains are unſpeakable. Nature gives the powers of every mind ſome particular direction: but that particular bias, impreſſed by the hand of nature, cannot be diſtinguiſhed before the period we have mentioned; and if you counteract nature, inſtead of ſeconding her views, the conſequences cannot but be highly unfavourable both to the heart and the underſtanding of your pupil.

Perhaps, in the midſt of ſociety, it may be difficult to bring up our pupil without giving him ſome idea of the relations between man and man, and of the morality of human actions. Let that, however, be deferred as long as poſſible.

Were Emilius to witneſs a ſcene of anger, and to aſk the cauſe of the appearances which he beheld, he ſhould be told that the perſons were affected with a fit of ſudden illneſs. We might thus perhaps prevent the unhappy effects of ſuch an example.

The firſt moral notions which ſhould be communicated to the child are thoſe of property. To communicate the ideas of property to our pupil, we will direct him to take poſſeſſion of ſomething; for inſtance, of a piece of ground belonging to ſome other perſon, and in a ſtate of cultivation. Let him cultivate this ſpot of ground anew, ſow it with ſeeds, and look eagerly forward to the time of harveſt in the hopes of reaping the fruit of his labours. In the mean time, let the proprietor of the ground take notice of what is done, deſtroy your pupil's riſing crop, and complain of the injuſtice done him. While the boy laments his loſs and the diſappointment of his hopes, in all the bitterneſs of grief, let the proprietor of the ground ſtill inſiſt on the injury done him, and complain of what he ſuffers by the purpoſe for which he himſelf had cultivated and ſown the ground being fruſtrated. Our pupil, now ſenſible of the reaſonableneſs of the other's claims, will deſiſt from his lamentations, and only beg to have ſome other ſpot aſſigned him which he may cultivate at his pleaſure without offending any perſon. This he will juſtly conſider as his own property, to the productions of which raiſed by his own labour he has an excluſive right, and in the occupying of which none ought to moleſt him. In ſome ſuch manner as this may the nature of property, the idea of which eaſily refers in this inſtance to the firſt occupier, and afterwards the exchange of property, be explained to him.

Another inſtance of the manner in which the pupil is now to be managed may not be improper in this place. He is poſſibly ſo rude and boiſterous as to ſpoil or break whatever is within his reach. Be not angry with him, however, if he break the utenſils which he has conſtant need of; be in no haſte to ſupply him with others in their room; let other things be removed out of his way: if he break the windows of his apartment, let him be expoſed night and day to the cold; complain not of the inconvenience yourſelf, but order matters ſo that he may feel it. After ſome time, let them be mended up; and if he break them again, change your method. Tell him calmly, "Theſe windows are mine; I took care to have them put there; and I will prevent their being again broken, by confining you in a dark room." Let all his endeavours to avoid this prove ineffectual. Let him be actually confined, and be liberated only on propoſing and agreeing to the condition of breaking no more windows. When he propoſes this condition, be ready to liſten to him; obſerve that it is well thought on, and that it is a pity he did not think of it ſooner. Conſider this engagement between you as ſacred; treat him as before, and you cannot fail to attain the end in view.

The moral world now opens to us: But no ſooner are we able to diſtinguiſh between right and wrong, than we become deſirous to conceal thoſe inſtances in which we act wrong. Lying is therefore a vice of which your pupil is now apt to be guilty: you cannot always prevent, but you can puniſh; but let the puniſhments which you inflict appear to the child only the natural conſequences of his conduct. If he is in any inſtance convicted of a lie, let his aſſertions no longer gain credit. By this means, ſooner than by precepts, or any other ſpecies of puniſhment, will you be able to reclaim him from the habit of lying.

The methods generally taken to render children virtuous are prepoſterous and fooliſh. To render them generous and charitable, we give them money, and bid them beſtow it in alms, while we ourſelves give nothing; but the parent or maſter, and not the child, ſhould beſtow the alms. Example might produce the wiſhed-for effect. Beſides, children are ſtrangers to the value of money. A gingerbread cake is more to them than an hundred guineas. Though you teach them to give away money, till you perſuade them to part readily with thoſe things which they value moſt, you do not inſpire them with generoſity. Would you make them liberal by ſhowing them that the moſt liberal is always beſt provided for? this is to teach covetouſneſs, not liberality. Example is the only means by which you can, at this period, hope to teach your pupil any of the virtues.

The only leſſon of morality that can with any propriety be inculcated on children, is to injure no perſon. Even the poſitive precept of doing good, muſt be conſidered as ſubordinate to this negative one of doing no harm. The moſt virtuous and the moſt exalted of characters, is the man who does the leaſt harm to his fellow-creatures.

In a public education, it will be neceſſary to attempt the communication of moral inſtruction at an earlier period than in a private one. In a private education, it will always be beſt to allow the moral powers of children to ripen as much as poſſible before you endeavour to inform and direct them by precepts.

There is an inequality among geniuſes; and fond mothers and fathers may be diſpoſed to plead for exceptions in favour of ſuch of their children as they view with a partial eye. "This boy's mind is more capacious, his powers are riper, than thoſe of others." But however great the ſeeming diſparity of geniuſes may be, it is at bottom but inconſiderable. Let the age of children be therefore regarded as a common meaſure by which their treatment is to be regulated.

However quick and tenacious the memories of children may ſeem, they can derive little advantage from the exertions of memory till ſuch time as judgment begins to act. All the knowledge that they acquire in the courſe of the uſual ſyſtem of education, is merely the knowledge of words. The languages, geography, chronology, in ſhort all that they are taught, and called to diſplay ſo oſtentatiouſly at this period of life, ſerve no other purpoſe than to fill their minds with words.

29 H y, he far er to bout in- the ds of s.

Hiſtory is eſteemed a proper thing to be put into the hands of children. But except you wiſh to confine their attention to the external and phyſical actions, it is almoſt nothing they can acquire by the peruſal of it. And if diveſted of the moral diſtinctions of actions, of the workings of the paſſions, and the complication of intereſts, what is there to render hiſtory entertaining? We may indeed eaſily teach them to repeat the words *kings*, *emperors*, *wars*, *conqueſts*, *revolutions*, *laws*: but of the things which you uſe theſe words to denote, you will find they are hitherto incapable of forming any clear ideas.

But the mere knowledge of words is not ſcience; make your pupil acquainted with things, and he will not fail to acquire their names. Emilius muſt never be ſet to get any compoſition by heart, not even fables: be careful to place before him thoſe ſcenes and objects, the images of which it may be uſeful for him to have impreſſed on his memory; but by no other means ſeek to aſſiſt him to improve that faculty.

Emilius ſhall not even learn to read till he attain the age of twelve: for, before that period, it can be of no benefit to him; and the labour would only make him unhappy during that period of life which is naturally the golden part of our days. But when he has attained the proper age, matters ſhall be ſo ordered, that he ſhall find his ignorance of letters an inconvenience. A card ſhall be ſent him, which being unable to read, he will apply to ſome of thoſe about him. They may be unwilling to oblige him, or otherwiſe engaged. If, at length, it is read to him, that may be when it is now too late to take advantage of ſome agreeable invitation which it contained. This may be two or three times repeated. At length he becomes eager to learn to read; and accompliſhes that almoſt without aſſiſtance.

The principle on which we proceed, is to leave the pupil almoſt wholly under his own direction, ſeemingly at leaſt; to lead him to acquire new accompliſhments, ſolely from the deſire of increaſing his powers, and extending his influence; and humbly to follow nature, not to force her.

As we are deſirous of cultivating his underſtanding, the means which we employ for that purpoſe is, to cultivate thoſe abilities on which it depends; he is always active and in motion. Let us firſt make him a man in point of health and vigour, and he will ſoon become a man in underſtanding.

By our conſtant attention to the welfare of children, we render it unneceſſary for them to attend to it themſelves. What occaſion has your ſon or pupil to obſerve whether the aſpect of the ſky threaten rain, when he knows that you will take care to have him ſheltered from a ſhower? or to regulate the length of his excurſions, when he is ſure that you will not ſuffer him to loſe his dinner?

While matters are ſo ordered that Emilius thinks himſelf ſubject only to his own will, though all his motions are regulated according to your pleaſure; inſtead of becoming fantaſtic and capricious, he inſenſibly acquires the habit of keeping utility in view in all his actions.

The firſt objects which engage the attention of children are the appearances of the material world around them: our firſt ſtudy is a kind of experimental philoſophy; our inſtruments and inſtructors are our hands, our feet, and our eyes. By exerciſing theſe bodily organs, the boy will acquire more real knowledge even in the period of childhood, than if we ſhould dedicate nine-tenths of his time to books, from the age of ſix to ſixty. All who have examined, with any ſagacity, the characters, circumſtances, and manners of the ancients, have agreed in attributing to their gymnaſtic exerciſes that ſuperior ſtrength of body and mind which renders them objects of admiration to the moderns.

Our pupil's clothes cannot be too light and eaſy. If tight and cloſe, they fetter and confine his joints and limbs, and likewiſe obſtruct the circulation of the blood; if accuſtomed to warm clothing, he will ſoon become incapable of bearing cold.

30 Expoſure and exerciſe.

In every thing let him be habituated to what is plain and hardy. Let his bed be coarſe and hard, his clothes plain, his fare ſimple. Infants muſt be freely indulged in ſleep: but as Emilius is now advanced beyond infancy, he muſt be accuſtomed at times to go to bed late and get up early, to be ſometimes haſtily waked from ſleep; and thus to prepare himſelf for what he may afterwards have occaſion to ſubmit to in the courſe of life.

As this period is in a particular manner that of exerciſe, and Emilius is encouraged to take as much exerciſe as he chooſes; we muſt endeavour to prompt, but without ſeeming to direct him to ſuch as are moſt proper. Swimming, though not generally attended to, is yet one of the firſt which a boy ought to learn. It may, in many occaſions in life, be of the greateſt advantage, by enabling us to ſave our own life or the life of others. Emilius ſhall be taught to ſwim; he ſhall be taught whatever can really enlarge the ſphere of his power: "could I teach him to fly in the air, I would make him an eagle; if to bear the fire, a ſalamander."

To exerciſe the ſenſes is not merely to make uſe of them; it is to learn to judge by them. Call not your pupil to exert all his ſtrength on every occaſion; but let him learn to judge of the truth of the information which he receives from one ſenſe, by having recourſe to the evidence of another.

It is not impoſſible to improve the ſenſes to an higher degree of perfection than that which they uſually attain. Blind men generally poſſeſs the ſenſe of touch in a more exquiſite degree, than we who have alſo eyes to guide and inform us. But they acquire this ſuperior delicacy and acuteneſs of ſenſation, only by their finding it neceſſary to have more frequent recourſe to the information of that ſenſe. Here is then a wide field for improvement and agreeable exerciſe to our pupil.

31 Darkneſs and ghoſts.

What a variety of uſeful diverſions might he be led to entertain himſelf with in the courſe of the night. The hours of darkneſs are generally hours of terror, not only to men, but alſo to the brute animals. Even reaſon, knowledge, and courage, are not always ſufficient to render us ſuperior to the terror which darkneſs inſpires.

This timidity is uſually attributed to the tales of ghoſts and goblins with which we are frightened in infancy. But it originates from another cauſe; our ignorance of what is paſſing around us, and our inability to diſtinguiſh objects during that period of darkneſs. The paſſion of fear was implanted by nature in the human breaſt, in order that it might ſerve to put us on our guard againſt danger. But in conſequence of our being ſubject to the influence of that paſſion, when we are ignorant of what ſurrounds us, imagination calls up dangers on all hands. And ſuch is the cauſe from which our terror in darkneſs naturally ariſes.

But the only way to free our pupil from this tyranny of imagination, is to oppoſe to it the power of habit. A bricklayer or tyler is never giddy on looking down from the roofs of houſes. Neither will our pupil be alarmed by the terrors of darkneſs, if he be accuſtomed to go frequently abroad under night. It is eaſy to contrive a number of little amuſements, the agreeableneſs of which may, for a time, overcome our pupil's averſion for darkneſs; and thus may a habit be at length impreſſed.

Let us give yet another inſtance of the means by which children may be led to do what we wiſh, without our impoſing any reſtraint on their will. Suppoſe Emilius is lazy and inactive, and we wiſh to make him learn to run. When walking out with the young ſluggard after dinner, I would ſometimes put a couple of his favourite cakes in my pocket: of theſe each of us ſhould eat one in the courſe of our walk. After ſome time I would ſhow him I had put a third cake in my pocket. This he would not fail to aſk after finiſhing his own: no, ſays I, I can eat it myſelf, or we will divide it;—or ſtay, we had better let theſe two little boys there run a race for it. Accordingly I propoſe the race to the boys; who readily accept the conditions, and one of them carries off the prize. After ſeeing this ſeveral times repeated, Emilius begins to think himſelf qualified to obtain the third cake as well as any of the little boys, and to look upon running as an accompliſhment of ſome conſequence. He ſeeks an opportunity of being permitted to enter the liſts. He runs; and after being two or three times outſtripped, is at length ſucceſsful, and in a ſhort time attains an undoubted ſuperiority.

32 Drawi

As children naturally imitate almoſt whatever they behold, they are often diſpoſed to attempt drawing. In this our pupil might be indulged, not merely for the ſake of the art, but to give him a ſteady hand and a good eye. But he ſhould draw from nature, not from other drawings or from prints. Were he to draw the likeneſs of a horſe, he ſhould look at the animal: if to attempt a repreſentation of a houſe, he ſhould view the houſe itſelf. In this method he will, no doubt, ſcratch for a long time without producing any likeneſs: but he will acquire what we propoſed as the ends of his attempting to draw; namely, ſteadineſs of hand and juſtneſs of ſight, by this method, ſooner than by any others.

33 Geome

Geometry, when taught in the uſual way, is certainly above the capacity of children; they cannot go along with us in our reaſonings: Yet they are not totally incapable of acquiring even this difficult ſcience; if, when they are proſecuting their amuſements, you lead them inſenſibly to obſerve the properties of the circle, the triangle, and the ſquare, and place them now and then in circumſtances when they may have occaſion to apply their knowledge of theſe to real uſes in life.

A child has been taught the various relations between the outlines, ſurfaces, and contents of bodies, by having cakes ſet before him, cut into all manner of regular ſolids; by which means he was led to maſter the whole ſcience of Archimedes, by ſtudying which form contained the greateſt quantity.

There is a period between infancy and the age of puberty at which the growth and improvement of our faculties exceed the increaſe of our deſires. About 12 or 13, when the appetite for the ſex has not yet begun to make itſelf felt, when unnatural wants are yet unknown, no falſe appetites yet acquired; at that period, though weak as a man, as a child the youth is ſtrong.

This interval, when the individual is able to effect more than is neceſſary for the gratification of his wiſhes, contains the moſt precious moments of his life, which ought to be anxiouſly filled up in an uſeful manner. This is the beſt time for employment, for inſtruction, for ſtudy.

Now, let us begin to conſider what is uſeful; for, hitherto, we have only inquired what was neceſſary. In entering on our ſtudies, we will make no account of any but ſuch as inſtinct directs us to purſue: thoſe which the pedants and the pretended philoſopher are im-ation.

impelled to purſue ſolely from the deſire of attracting the admiration of mankind, are unworthy of our notice.

The earth which we inhabit, and the ſun by whoſe beams we are enlightened, are the firſt objects which claim our attention. We will therefore direct the attention of our pupil to the phenomena of nature. We will lead him to the knowledge of geography, not by maps, ſpheres, and globes: we will lead Emilius out on ſome beautiful evening to behold the ſetting ſun. Here we take particular notice of ſuch objects as mark the place of his going down. Next morning we viſit the ſpot to contemplate the riſing of the glorious luminary. After contemplating for ſome time the ſucceſſive appearances which the ſcene before us aſſumes, and making Emilius obſerve the hills and the other ſurrounding objects, I ſtand ſilent a few moments, affecting to be occupied in deep meditation: At laſt I addreſs him thus: “I am thinking, that, when the ſun ſet laſt night, it went down yonder; whereas this morning, you ſee he is riſen on the oppoſite of the plain here before us. What can be the meaning of this?” I ſay nothing more at this time, but rather endeavour to direct his attention to other objects.

This is our firſt leſſon in coſmography.

Our laſt obſervation was made about Midſummer; we will next view the riſing ſun on ſome fine morning in the middle of winter. This ſecond obſervation ſhall be made on the very ſame ſpot which we choſe for the former. When Emilius and I perceive the ſun now emerging above the horizon, we are ſtruck at the change of the place of his riſing.—By ſuch leſſons as theſe may the pupil be gradually taught a real, not a ſeeming, acquaintance with the relative motions of the ſun and the planets and with geography.

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During the firſt period of childhood, the great object of our ſyſtem of education was to ſpend our time as idly as poſſible, in order that we might avoid employing it to an ill purpoſe: but our views are now changed with our pupil's progreſs in life; and we have ſcarce enough of time for the accompliſhment of our neceſſary purſuits. We therefore proceed as quickly as poſſible in making ourſelves acquainted with the nature of the bodies around us, and the laws by which their motions and appearances are regulated. We keep to this ſtudy at preſent, as being neceſſary for the moſt important purpoſes in life, and as being the moſt ſuitable to the preſent ſtate of our pupil's powers. We ſtill begin with the moſt common and obvious phenomena of nature, regarding them as mere facts; and, advancing from theſe, we come to generalize by degrees.

As ſoon as we are ſo far advanced as to be able to give our pupil an idea of what is meant by the word *uſeful*, we have attained a conſiderable influence over his future conduct. On every occaſion after this a frequent queſtion between us will be, Of what uſe is that? This ſhall be the inſtrument by means of which I ſhall now be able to render him abſolutely ſubmiſſive to my wiſhes. However, I will allow him to make uſe of it in his turn, and will be careful not to require of him to do or learn any thing the utility of which he cannot comprehend.

Education.

35
Robinſon Cruſoe.

Books only teach people to talk about what they do not underſtand. Emilius ſhall have as little recourſe as poſſible to books for inſtruction. Yet if we can find a book in which all the natural wants of man are diſplayed in a manner ſuitable to the underſtanding of a child, and in which the means of ſatisfying thoſe wants are gradually diſplayed with the ſame eaſe and ſimplicity; ſuch a book will be worthy of his moſt attentive ſtudy. There is ſuch a book to be found; but it is neither Ariſtotle, nor Pliny, nor Buffon; it is Robinſon Cruſoe. Emilius ſhall have the adventures of Robinſon put into his hands: he ſhall imitate his example; even affect his dreſs; and, like Robinſon, learn to provide for himſelf without the aid of others.

Another employment of Emilius at this period ſhall be, to viſit the ſhops of various artiſans; and when he enters a ſhop, he ſhall never come out without lending a hand to the work, and underſtanding the nature and the reaſon of what he ſees going forward.

Still, however, we are careful to afford not a hint concerning thoſe ſocial relations the nature of which he is not yet able to comprehend.

The value and importance of the various arts are ordinarily eſtimated, not according to their real utility, but by a very injudicious mode of eſtimation: Thoſe which contribute in a particular manner to the gratification of the fantaſtic wiſhes of the rich, are preferred to thoſe which ſupply the indiſpenſable neceſſaries of life. But Emilius ſhall be taught to view them in a different light. Robinſon Cruſoe ſhall teach him to value the ſtock of a petty ironmonger above that of the moſt magnificent toy-ſhop in Europe. Let us eſtabliſh it as a maxim, that we are to lead our pupil to form juſt notions of things for himſelf, not to dictate to him ours. He will eſtimate the works both of nature and art by their relation to his own convenience; and will therefore regard them as more precious than gold—a ſhoemaker or a maſon, as a man of more importance than the moſt celebrated jeweller in Europe.

The intercourſe of the arts conſiſts in the reciprocal exchange of induſtry; that of commerce, in the exchange of commodities; and that of money, in the exchange of bills and caſh. To make our pupil comprehend the nature of theſe, we have now only to generalize and extend to a variety of examples thoſe ideas of the nature of property, and of the exchange of property, which we formerly communicated to him. The nature of money, as bearing only a conventional value, which it derives from the agreement of men to uſe it as a ſign for facilitating commerce, may be now explained to Emilius, and will be eaſily comprehended by him. But go no farther: ſeek not yet to explain to the child in what manner money has given riſe to the numerous chimeras of prejudice and caprice; nor how countries which abound moſt in gold and ſilver, come to be the moſt deſtitute of real wealth.

Still our views are directed to bring up our pupil in ſuch a manner that he may be qualified to occupy any place in the order of ſociety into which even the caprice of fortune can throw him. Let us make him a man; not a ſlave, a lord, or a monarch. How much ſuperior the character of a king of Syracuſe turned ſchoolmaſter at Corinth, of a king of Macedon become a notary at Rome, to an unhappy Tarquin incapable of ſupporting himſelf in a ſtate of independence when expelled from his kingdom!

36 The propriety of making a young man, in whatever ſphere of life, learn a trade.

Whatever be our ſituation in the world, we can contribute nothing but our perſonal abilities to ſociety. To exert them is therefore the indiſpenſable duty of every one who enjoys the advantages of a ſocial ſtate; and to cultivate them in our pupil to the beſt purpoſe, ought to be the great aim of every courſe of education. Emilius has already made himſelf familiar with all the labours of huſbandry; I can therefore bid him cultivate the land which he inherits from his father. But if it ſhould be loſt, what ſhall be his reſource? He ſhall learn a trade, that he may be provided againſt ſuch an accident. And he ſhall not be a politician, a painter, a muſician, or an architect; to gain employment for his talents in any of theſe arts, would coſt him no leſs trouble than to regain his loſt eſtate. He ſhall learn ſome ſimple mechanical art: he will then need only to ſtep into the firſt ſhop he ſees open, to perform his day's labour, and receive his wages.

It may be here proper to take notice of a miſtake into which people generally fall in determining the trade or profeſſion in which they are to place their children. Some accident diſpoſes the child to declare himſelf for a particular employment: the parent regards that as the employment to which his talents are fitted by the deſign of nature; and permits him to embrace it without inquiring whether another would have been more ſuitable or advantageous. But becauſe I am pleaſed with my occupation, I am not on that account neceſſarily qualified for it. Inclinations do not confer abilities. It requires more careful and accurate obſervation than is generally imagined, to diſtinguiſh the particular taſte and genius with which nature has endowed the mind of a child. We view him careleſsly, and of conſequence we are apt to miſtake caſual inclination for original diſpoſition.

But Emilius needs not now to heſitate about the occupation which he is to chooſe. It is to be ſome mechanical employment. All the diſtinction we have now to make is, to prefer one that is cleanly and not likely to be injurious to his health. We ſhall make choice of that of a joiner. We cannot dedicate all our time to the trade; but at leaſt for two days in the week we will employ ourſelves in learning our trade. We will have no workſhop erected for our convenience, nor will we have a joiner to wait on us in order to give us the neceſſary inſtructions: but for the two days in every week which we dedicate to the purpoſe of learning a trade, we will go to our maſter's workſhop; we will riſe before him in the morning; work according to his orders; eat at his table; and, after doing ourſelves the honour of ſupping with his family, return to our own hard mattreſſes at night. We ſhall be treated only according to the merit of our performances. Our maſter ſhall find fault with our work when clumſily or negligently done, and be pleaſed with it only when well executed.

37 New ideas ſuggeſted to Emilius by his application to a trade.

While my pupil has been accuſtomed to bodily exerciſe and manual labour, his education has been hitherto conducted in ſuch a manner as to give him inſenſibly a taſte for reflection and meditation. Before he has been long a workman, therefore, he will begin to become more ſenſible of that inequality of ranks which takes place in the order of ſociety. He will therefore take notice of his own dependence, and of my apparent wealth, and will be deſirous to know why I contribute not my perſonal exertions to ſociety. I put off the queſtion with telling him, that I beſtow my ſuperfluous wealth on him and the poor; and will take to make a bench or table every week, that I may not be quite uſeleſs to the public.

38 Progre that E lius ha made b fore th age of berty.

And now when about to enter the moſt critical period of life, when juſt on the brink of that age at which the heart and blood begin to feel the impulſe of a new appetite, what progreſs has our pupil made? what knowledge has he acquired? All his ſcience is merely phyſical. Hitherto he has ſcarce acquired any ideas of moral relations; but the eſſential relations between men and things he has attentively ſtudied. He knows the general qualities of certain bodies; but upon thoſe qualities he has not attempted to reaſon. He has an idea of abſtract ſpace, by means of geometrical figures; of abſtract quantity, by means of algebraical ſigns. He has no deſire to find out the eſſence of things; their relations alone intereſt him. He values nothing external but from its relation to himſelf. The general conſent of mankind, or the caprice of cuſtom, have not yet given any thing a value in his eyes; utility alone is his meaſure of eſtimation. He is laborious, temperate, patient, reſolute, and bold. His imagination never exaggerates danger. He ſcarce knows as yet what death is; but ſhould it approach him, he is prepared to ſubmit to neceſſity. He is virtuous in every thing relative merely to himſelf. He is prepared to become a virtuous member of ſociety as ſoon as he ſhall be made acquainted with the nature of his ſocial relations. He is free from vice and error as far as is poſſible for human nature. He conſiders himſelf as unconnected with others; requires nothing from any perſon, and thinks none has a right to require any thing of him. Sure a youth arrived thus at his fifteenth year has not miſpent the period of his infancy.

39 New m ſures to adopte his edu tion at age.

But now our pupil has reached the moſt critical period of life. He now feels the influence of the paſſion for the ſex; and as ſoon as we become ſubject to the influence of that paſſion, we are no longer unſocial beings. The want of a miſtreſs ſoon produces the want of a friend.

As hitherto we have been careful not to force or anticipate nature, ſo even now our attention muſt be directed to divert the impulſes of that dangerous appetite which now begins to make itſelf felt. To confine the growing paſſions within proper limits, let it be our care to defer as long as poſſible the time at which they begin to diſplay themſelves. For this purpoſe, let us cautiouſly guard our words and actions in the preſence of our pupil. Let us be careful to give him no premature inſtructions.

To excite and cheriſh that ſenſibility of mind which now firſt begins to ſhow itſelf, to extend the care of the youth beyond himſelf, and to intereſt him in the welfare of his fellow creatures; let us be careful to put ſuch objects in his way as have a tendency to call forth and refine the feelings. It is not poſſible for the human heart to ſympathiſe with thoſe who are happier than ourſelves: our ſympathy is moved only by the ſight of miſery. We pity in others only thoſe diſtreſ-

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ſes to which we ourſelves are liable; and our pity for the misfortunes of others is meaſured, not by the quantity of the evil, but by the ſuppoſed ſenſibility of the ſufferer. Let theſe obſervations ſerve to direct us in what manner we are to form the minds of children to humanity and compaſſion.

In proſecution of our deſign, to retard rather than accelerate the growth of the paſſions, let us, when that critical period which we have ſo much feared comes on, ſeclude him as much as poſſible from the intercourſe of ſociety, where ſo many objects appear to inflame the appetites. Let us be circumſpect in the choice of his companions, his employment, his pleaſures. Let all our care be directed to nouriſh his ſenſibility without inflaming his deſires. As his moral powers now begin to unfold themſelves; in cultivating them, let us proceed not by way of lecture, or by directing his attention to books, but ſtill by leading him to acquire experience. At length the period will arrive for communicating to him ſome religious inſtruction. When he knows the nature of his relations to ſociety, he may be informed of his relation to and dependence upon a Deity.

[The creed of the Savoyard curate, containing thoſe ſentiments concerning religious matters which Rouſſeau ſeems to propoſe as the moſt proper to be inculcated on his pupil, comes next in the order of the work; but it does not appear to be ſo cloſely connected with the ſubject of education as to render it proper for us to give a view of it in this place. The ſentiments which he there advances, the reaſonings which he urges, are evidently hoſtile to revealed religion; and the power of his eloquence has adorned ſlight and ſuperficial arguments with ſuch a charm, that even the ſterneſt believer, if not abſolutely deſtitute of taſte and feeling, muſt read them with delight.]

And now, notwithſtanding all my arts, I can no longer keep back that moment which I have endeavoured to defer to as late a period as poſſible. As ſoon as I perceive that it has certainly arrived, I no longer treat Emilius as my pupil or diſciple, but as my friend. His affections are now expanded beyond himſelf; his moral powers have begun to exert themſelves, and have received ſome cultivation; he alſo is become capable of religious ſentiments, and inſtructed in the nature of his relation to a ſupreme Being. Beſides, it is now requiſite, if we conſider the period to which nature has conducted him, that he ſhould no longer be treated as a ſimple child. Hitherto ignorance has been his guardian, but now he muſt be reſtrained by his own good ſenſe.

Now is the time for me to give him in my accounts; to ſhow him in what manner his time and mine have been employed; to acquaint him with his ſtation and mine, with our obligations to each other, his moral relations, the engagements he has entered into with regard to others, the degree of improvement which he has attained, the difficulties he will hereafter meet with, and the means by which he may ſurmount them: —in a word, to point out to him his critical ſituation, and the new perils which ſurround him; and to lay before him all the ſolid reaſons which ſhould engage him to watch with the utmoſt attention over his conduct, and to be cautious of indulging his youthful deſires.

40
Means employed to preſerve the purity of his manners.

Books, ſolitude, idleneſs, a ſedentary and effeminate life, the company of women and young people, are what he muſt carefully avoid at this age. He has learned a trade, he is not unſkilled in agriculture; theſe may be means, but not our only means, for preſerving him from the impulſe of ſenſual deſire. He is now too familiar with theſe: he can exerciſe them without taking the trouble to reflect; and while his hands are buſy, his head may be engaged about ſomething quite different from that in which he is employed. He muſt have ſome new exerciſe which may at once fix his attention and cauſe him to exert his bodily powers. We can find none more ſuitable for this purpoſe than hunting. Now, therefore, Emilius ſhall eagerly join in the chace; and though I do not wiſh him to acquire that cruelty of diſpoſition and ferocity of temper which uſually diſtinguiſh thoſe who dedicate their lives to that barbarous diverſion, yet at preſent it may have the happieſt effects in ſuſpending the influence of the moſt dangerous of paſſions.

When I have now conducted my pupil ſo far; have informed him of what I have done for him, and of the difficulty of his ſituation; and have reſigned my authority into his hands; he is ſo ſenſible of the dangers to which he is expoſed, and of the tender ſolicitude with which I have watched over him, that he ſtill wiſhes to continue under my direction. With ſome feigned difficulty I again reſume the reins. My authority is now eſtabliſhed. I may command obedience; but I endeavour to guard againſt the neceſſity of uſing it in this manner.

To preſerve him from indulging in licentious pleaſures, I let him know that nature has deſigned us for living in a ſtate of marriage, and invite him to go in ſearch of a female companion. I will deſcribe to him the woman whom he is to conſider as worthy of his attachment in the moſt flattering colours. I will array her in ſuch charms, that his heart ſhall be hers before he has once ſeen her. I will even name her: her name ſhall be Sophia. His attachment to this imaginary fair one will preſerve him from all the allurements of unlawful love. Beſides, I take care to inſpire him with ſuch reverence for himſelf, that, notwithſtanding all the fury of his deſires, he will not condeſcend to purſue the enjoyments of debauchery. And though I may now ſometimes entruſt him to his own care, and not ſeek to confine him always under my eye; yet ſtill I will be cautious to watch over his conduct with careful circumſpection.

But as Emilius is to be ſhortly introduced to his Sophia, it may perhaps be proper for us to inquire into her character, and in what manner ſhe has been brought up.

41
Diſtinctive characters of the two ſexes.

There is a natural difference between the two ſexes. The difference in the ſtructure of their bodies ſhows them to be deſtined by nature for different purpoſes in life, and muſt neceſſarily occaſion a diſtinction between their characters. It is vain to aſk which of them merits the pre-eminence: each of them is peculiarly fitted to anſwer the views of nature. Woman is naturally weak and timid, man ſtrong and courageous; the one is a dependent, the other a protector. As the guardian of her virtue, and a reſtraint on her deſires, woman is armed with native modeſty. Reaſon is the guide and governor of man. When a man and a wo-

Education man are united by conjugal vows, a violation of thoſe vows is evidently more criminal in the woman than in the man. The wife ought to be anſwerable for the genuineneſs of the offspring with which ſhe has been entruſted by nature. It is no doubt barbarous and wicked for the huſband to defraud his wife of the only reward which ſhe can receive for the ſevere duties of her ſex: but the guilt of the faithleſs wife is ſtill more atrocious; and the conſequences of her infidelity are ſtill more unhappy.

But if nature has eſtabliſhed an original diſtinction between the characters of the two ſexes; has formed them for different purpoſes, and aſſigned them different duties; it muſt follow, that the education of the one ſex ought to be conducted in a manner different from that of the other. The abilities common to the two ſexes are not equally divided between them; but if that ſhare which nature has diſtributed to woman be ſcantier than what ſhe has beſtowed on man, yet the deficiency is more than compenſated by the qualities peculiar to the female. When the woman confines herſelf to aſſert her proper rights, ſhe has always the advantage over man; when ſhe would uſurp thoſe of the other ſex, the advantage is then invariably againſt her.

But we require not that woman ſhould be brought up in ignorance. Let us conſider the delicacy of her ſex, and the duties which ſhe is deſtined to perform; and to theſe we may accommodate the education which we beſtow upon her. While boys like whatever is attended with motion and noiſe, girls are fond of ſuch decorations as pleaſe the eye. Dolls are the favourite plaything of the ſex in their infant years. This is an original taſte, of the exiſtence of which we have the plaineſt evidence. All therefore that we ought to do is, to trace and bring it under proper regulation. Allow the girl to decorate her baby in whatever manner ſhe pleaſes; while employed about that, ſhe will acquire ſuch ſkill and dexterity in thoſe arts which are peculiar to her ſex, that with ſcarce any difficulty ſhe will acquire needle-work, embroidery, and the art of working lace. Her improvements may even be extended as far as deſigning, an art ſomewhat connected with taſte in dreſs; but there is no reaſon that their ſkill in this art ſhould be carried farther than to the drawing of foliage, fruits, flowers, drapery, and ſuch parts of the art as bear ſome relation to dreſs. Always aſſign reaſons for the employment which you give to young girls, but be ſure you keep them conſtantly buſy. They ought to be accuſtomed to laborious induſtry, as well as to bear the abridgment of their liberty. Uſe every art to prevent their work from becoming diſagreeable to them. For that purpoſe, let the mother be careful to make herſelf agreeable. A girl who loves her mother or her aunt, will work cheerfully by them all day; while ſhe to whom her mother is not dearer than all the world beſides, ſeldom turns out well. Never ſuffer girls, even at their diverſions, to be entirely free from reſtraint, nor allow them to run from one amuſement to another. If you now and then detect your daughter uſing a little artifice to excuſe herſelf from obedience, reflect that artifice is, in a certain degree, natural to the fair ſex; and as every natural inclination, when not abuſed, is upright and good, why ſhould it not be cultivated? In order to give girls proper notions of dreſs, let them be taught to conſider ſplendor and elegance of dreſs as deſigned only to conceal the natural defects of the perſon; and to regard it as the nobleſt triumph, the higheſt praiſe, of beauty, to ſhine with unborrowed luſtre in the ſimpleſt attire. Forbid not young women to acquire thoſe arts which have a tendency to render them agreeable. Why refuſe them the indulgence of learning to dance, to ſing, and to ſtudy ſuch other accompliſhments as afterwards enable them to entertain their huſbands? Girls are more diſpoſed to prattle, and at an earlier age, than boys. We may now and then find it neceſſary to reſtrain their volubility. But the proper queſtion to them on ſuch occaſions is not, as to boys, *Of what uſe is this?* but, *What effects will this produce?* At this early period, when they are yet ſtrangers to the diſtinction between good and evil, and therefore unable to form a juſt judgment concerning any perſon's conduct, we ought to reſtrain them carefully from ſaying what may be diſagreeable to thoſe with whom they converſe.

Girls are no leſs incapable than boys of forming diſtinct notions of religion at an early age. Yet, and even for that very reaſon, religious inſtruction ſhould be communicated to them much ſooner than to the youth of the other ſex. Were we to wait the period when their mental faculties arrive at maturity, we might perhaps loſe the happieſt time, from our inability to make a right diſtinction. Since a woman's conduct is ſubject to public opinion, her belief ought therefore to depend, not on reaſon, but on authority. Every girl ought to follow the religion of her mother, every married woman that of her huſband. They cannot derive a rule of faith from their own inquiry. Let us therefore ſeek, not ſo much to inſtruct them in the reaſons of our belief, as to give them clear diſtinct notions of thoſe articles which we require them to believe. Be more careful to inſtruct her in thoſe doctrines which have a connection with morality, than in thoſe myſterious articles which we are required to believe, though we cannot comprehend them.

Such are the principles on which the education of Emilius's unknown miſtreſs has been conducted.

[Notwithſtanding the merit of that part of this treatiſe in which the author entertains us with the courtſhip between his Emilius and Sophia, it does not appear to be ſo intimately connected with the ſubject of education as to render it proper for us to preſent our readers with a view of it. We therefore paſs over the courtſhip, to give a view of our author's ſentiments concerning the advantages to be derived from travelling, and the manner in which it ought to be directed.]

4 Emili ſuch d miſtre

When Emilius has formed a firm attachment to Sophia, and by his aſſiduities has been ſo fortunate as to gain her affections, his great wiſh now is, to be united with her in the bonds of marriage. But as he is ſtill young, is but imperfectly acquainted with the nature of thoſe duties incumbent on him as a member of a particular ſociety, and is even ignorant of the nature of laws and government, I muſt ſeparate him from his Sophia, and carry him to gain a knowledge of theſe things, and of the character and circumſtances of mankind, in various countries, and under various forms of civil government, by travelling. Much has been ſaid con-

4 Trave

concerning the propriety of ſending young people to travel, in order to complete their education. The multiplicity of books is unfavourable to real knowledge. We read with avidity, and think that by reading we render ourſelves prodigiouſly wiſe. But we impoſe on ourſelves : the knowledge which we acquire from books is a falſe ſpecies of knowledge, that can never render us truly wiſe.

To obtain real knowledge, you muſt obſerve nature with your own eyes, and ſtudy mankind. But to gain this knowledge by travelling, it is not neceſſary that we ſhould traverſe the univerſe. Whoever has ſeen ten Frenchmen, has beheld them all ; and whoever has ſurveyed and compared the circumſtances and manners of ten different nations, may be ſaid to know mankind.

To pretend that no advantages may be derived from travelling, becauſe ſome of thoſe who travel return home without having gained much real improvement, would be highly unreaſonable. Young people who have had a bad education, and are ſent on their travels without any perſon to direct or ſuperintend their conduct, cannot be expected to improve by viſiting foreign countries. But they whom nature has adorned with virtuous diſpoſitions, who have been ſo happy as to receive a good education, and go abroad with a real deſign of improvement, cannot but return with an increaſe of virtue and wiſdom. In this manner ſhall Emilius conduct his travels. To induce him to improve in the moſt attentive manner that time which he ſhould ſpend in travelling, I would let him know, that as he had now attained an age at which it might be proper for him to form ſome determination with regard to the plan of his future life, he ought therefore to look abroad into the world, to view the various orders in ſociety, to examine the various circumſtances of mankind, under different forms of government, and in different parts of the globe ; and to chooſe his country, his ſtation, and his profeſſion. With theſe views ſhould Emilius ſet out on his travels ; and with theſe views, in the courſe of our travels, we ſhould inquire into the origin of ſociety and government, into the nature of thoſe principles by means of which men are united in a ſocial ſtate, into the various circumſtances which have given riſe to ſo many different forms of government, and into the neceſſary relation between government and manners. Our ſtay in the great towns ſhould be but ſhort : for as in them corruption of manners has riſen to a great height, and diſſipation reigns, a long ſtay in any great town might be fatal to the virtuous diſpoſitions of Emilius. Yet his attachment to Sophia would alone be ſufficient to ſave him from the dangers to which his virtue is expoſed. A young man muſt either be in love, or be a debauchee. Inſtances may be pointed out in which virtue has been preſerved without the aid of love ; but to ſuch inſtances I can give little credit.

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Emilius, however, may now return to his Sophia. His underſtanding is now much more enlightened than when he ſet out on his travels. He is now acquainted with ſeveral forms of government, their advantages and defects, with the characters of ſeveral different nations, and with the effects which difference in circumſtances may be expected to produce on the characters of nations. He has even been ſo fortunate as to get acquainted with ſome perſons of merit in each of the countries which he has viſited. With theſe advantages gained, and with affection unchanged and unabated, he returns to his Sophia. After having made him acquainted with the languages, the natural hiſtory, the government, the arts, cuſtoms, and manners, of ſo many countries, Emilius eagerly informs me that the period which we had deſtined for our travels is now expired. I aſk, What are then his purpoſes for life? He replies, that he is ſatisfied with the circumſtances in which nature has placed him, and with my endeavours to render him independent on fortune, and wiſhes only for his Sophia to be happy. After giving him a few advices for the regulation of his conduct in life, I conduct him to his Sophia, and behold him united with her in marriage. I behold him happy ; with affectionate gratitude he bleſſes me as the author of his happineſs ; and I thus receive the reward of all the pains with which I have conducted his education.

45
Remarks.

Such are the outlines of the ſyſtem of education propoſed by this ſingular and original genius. For originality of thought, affecting ſentiment, enchanting deſcription, and bold vehement eloquence, this book is one of the nobleſt pieces of compoſition, not only in the French language, but even in the whole compaſs of ancient and modern literature. The irregularity of his method, however, renders it a very difficult taſk to give an abridged view of his work. He conducts his pupil, indeed, from infancy to manhood : But inſtead of being barely a ſyſtem of education, his work is beſides a treaſure of moral and philoſophical knowledge. He has choſen a path, and follows it from the bottom to the ſummit of the hill : yet whenever a flower appears on the right or left hand, he eagerly ſteps aſide to pluck it ; and ſometimes, when he has once ſtepped aſide, a new object catches his eye and ſeduces him ſtill farther. Still, however, he returns. His obſervations are in many places looſely thrown together, and many things are introduced, the want of which would by no means have injured either the unity or the regularity of his work. If we attempt to review the principles on which he proceeds in reprobating the prevalent modes of education, and pointing out a new courſe, his primary and leading one ſeems to be, that we ought to watch and ſecond the deſigns of nature, without anticipating her. As the tree bloſſoms, the flowers blow and the fruit ripens each at a certain period ; ſo there is a time fixed in the order of nature for the ſenſitive, another for the intellectual, and another for the moral powers of man to diſplay themſelves. We in vain attempt to teach children to reaſon concerning truth and falſehood, concerning right and wrong, before the proper period arrive : We only confound their notions of things, and load their memories with words without meaning ; and thus prevent both their reaſoning and moral powers from attaining that ſtrength and acuteneſs of which they are naturally capable. He attempts to trace the progreſs of nature, and to mark in what manner ſhe gradually raiſes the human mind to the full uſe of all its faculties. Upon the obſervations which he has made in tracing the gradual progreſs of the powers of the human mind towards maturity, his ſyſtem is founded.

As it is impoſſible to communicate to the blind any juſt ideas of colours, or to the deaf of ſounds ; ſo it muſt be acknowledged, that we cannot poſſibly communicate

municate to children ideas which they have not faculties to comprehend. If they are, for a certain period of life, merely ſenſitive animals, it muſt be folly to treat them during that period as rational and moral beings. But is it a truth that they are, during any part of life, guided ſolely by inſtinct, and capable only of ſenſation? Or, how long is the duration of that period? Has nature unkindly left them to be, till the age of twelve, the prey of appetite and paſſion? So far are the facts of which we have had occaſion to take notice, concerning the hiſtory of infancy and childhood, from leading to ſuch a concluſion, that to us it appears undeniable that children begin to reaſon very ſoon after their entrance into life. When the material world firſt opens on their ſenſes, they are ignorant of the qualities and relations of ſurrounding objects: they know not, for inſtance, whether the candle which they look at be near or at a diſtance; whether the fire with which they are agreeably warmed may alſo affect them with a painful ſenſation. But they remain not long in this ſtate of abſolute ignorance. They ſoon appear to have acquired ſome ideas of the qualities and relative ſituation of bodies. They cannot, however, acquire ſuch ideas, without exerting reaſoning powers in a certain degree. Appearances muſt be compared, and inferences drawn, before knowledge can be gained. It is not ſenſation alone which informs us of the relative diſtances of bodies; nor can ſenſation alone teach us, that the ſame effects which we have formerly obſerved will be again produced by the ſame cauſe.

But if children appear capable of reaſoning at a very early period, they appear alſo to be at a very early period ſubject to the influence of the paſſions: they are angry or pleaſed, merry or ſad, friends or enemies, even while they hang at the breaſt; inſtead of being ſelfiſh, they are naturally liberal and ſocial. And if we obſerve them with candid attention, we will find that the paſſions do not diſplay themſelves ſooner than the moral ſenſe. As nature has wiſely ordered, that we ſhould not ſee, and hear, and feel, without being able to compare and draw inferences from our perceptions; ſo it is a no leſs certain and evident law of nature, that the paſſions no ſooner begin to agitate the human breaſt, than we become able to diſtinguiſh the beauty and the deformity of virtue and vice. The child is not only capable of gratitude and attachment to the perſon who treats him with kindneſs; he is alſo capable of diſtinguiſhing between gratitude and ingratitude, and of viewing each with proper ſentiments. He cries when you refuſe to gratify his deſires; but he boldly inſiſts that he is injured when you uſe him cruelly or unjuſtly. It is indeed impoſſible to attend to the conduct of children during infancy, without being convinced that they are, even then, capable of moral diſtinctions. So little are they acquainted with artificial language, that we and they do not then well underſtand each other. But view their actions; conſider thoſe ſigns by which nature has taught them to expreſs themſelves. Our limbs, our features, and our ſenſes, are not gradually and by piecemeal beſtowed as we advance towards maturity; the infant body comes not into the world mutilated or defective: why then, in point of mental abilities, ſhould we be for a while brutes, without becoming rational and moral beings till the fulneſs of time be accompliſhed? All the differences between the phenomena of manhood and thoſe of infancy and childhood may be accounted for, if we only reflect, that when children come into the world, they are totally unacquainted with all the objects around them; with the appearances of nature, and the inſtitutions of ſociety; that they are ſent into the world in a feeble ſtate, in order that the helpleſſneſs occaſioned by their ignorance may attract the notice and gain the aſſiſtance of thoſe who are able to help them; and that they attain not full ſtrength in the powers either of mind or body, nor a ſufficient acquaintance with nature, with artificial language, and with the arts and inſtitutions of ſociety, till they arrive at manhood.

Even Rouſſeau, notwithſtanding the art with which he lays down his ſyſtem, cannot avoid acknowledging indirectly, on ſeveral occaſions, that our ſocial diſpoſitions, our rational and our moral powers, diſplay themſelves at an earlier period than that at which he wiſhes us to begin the cultivation of them.

But though the great outlines of his ſyſtem be merely theory, unſupported by facts, nay plainly contradictory to facts; yet his obſervations on the impropriety or abſurdity of the prevalent modes of education are almoſt always juſt, and many of the particular directions which he gives for the conducting of education are very judicious. He is often fanciful, and often deviates from the common road, only to ſhow that he is able to walk in a ſeparate path. Yet why ſhould he be oppoſed with ſo much virulence, or branded with ſo many reproachful epithets? His views are liberal and extenſive: his heart ſeems to have glowed with benevolence: his book contains much obſervation of human actions; diſplays an intimate acquaintance with the motives which ſway the human heart; and if not a perfect ſyſtem for education, is yet ſuperior to what any other writers had before done upon the ſubject. It is ſurely true, that we ourſelves often call forth evil paſſions in the breaſts of children, and impreſs them with bad habits: it is no leſs true that we put books in their hands, and load their memory with words, when we ought rather to direct their attention to things, to the phenomena of nature, and the ſimpleſt arts of life. The form in which he has choſen to communicate his ſentiments on the ſubject of education renders the peruſal of it more pleaſing, and his precepts more plain, than they would otherwiſe have been: it is nearly that dramatic form with which we are ſo much delighted in ſome of the nobleſt compoſitions of the ancients.

After viewing the public eſtabliſhments for education which exiſted in ſome of the moſt renowned ſtates of antiquity; and after liſtening to the ſentiments of the experienced Quinctilian, the learned Milton, the judicious Locke, and the bold fanciful Rouſſeau, on this intereſting ſubject; it may now be proper to lay before the reader our own ſentiments concerning the education of youth under a few diſtinct heads.

Indeed, if we were diſpoſed to give abridgments of all the books which have been written on the ſubject of education, or even to hint at all the various modes which have been recommended by teachers or theoriſts, we might ſwell this article to an amazing ſize: Nay, were we only to take notice of the many elegant and ſenſible writers who have of late endeavoured to call the attention of the public to this ſubject, we might extend it to an immoderate length. A Kames, a Prieſtley,

ley, a Knox, a Madame de Sillery, and a Berquin, might well attract and fix our attention. But as, among ſuch a crowd of writers, every thing advanced by each cannot be original; and even of thoſe things which are original only a certain, and that perhaps even a moderate, proportion, can be juſt and judicious; and as they often either borrow from one another, or at leaſt agree in a very friendly manner, though in ſome things they profeſs a determined hoſtility; therefore we ſhall content ourſelves with having taken notice of four of the moſt reſpectable writers on the ſubject.

In preſenting to our readers the reſult of our own obſervations and reflections, we ſhall throw our thoughts nearly under the following heads. The management of children from their birth till they attain the age of five or ſix; from that period till the age of puberty; and from that age till manhood; private and public education; religion and morals; the languages; natural philoſophy; the education of people of rank and fortune; education of perſons deſigned for a mercantile employment, and for the other humbler occupations in active life not particularly connected with literature; education of the female ſex; foreign travel; knowledge of the world; and entrance into active life. We do not pretend to be able to include under theſe heads every thing worthy of notice in the ſubject of education: but under theſe we will be able to comprehend almoſt every thing of importance that has occurred to us on the ſubject.

## I. *On the Management of Infants from the Time of their Birth till they attain the Age of five or ſix.*

The young of no other animal comes into the world in ſo helpleſs a ſtate, or continues ſo long to need aſſiſtance, as that of the human ſpecies. The calf, the lamb, and the kid, are vigorous and lively at the inſtant of their birth; require only, for a very ſhort period, nouriſhment and protection from their reſpective dams; and ſoon attain ſuch degrees of ſtrength and activity as to become entirely independent. The infancy of the oviparous animals is not of longer continuance: And, indeed, whatever department of the animal world we may chooſe to ſurvey, we ſtill find that no ſpecies is ſubject to the ſame ſevere laws as man during the firſt period of life.

46 Man compared to the animals in reſpect to the helpleſſneſs of infancy.

Yet the character and the views of man are ſo very different from thoſe of the other animals, that a more careful attention to theſe may perhaps induce us to regard this ſeeming ſeverity rather as an inſtance of the peculiar kindneſs of the Author of nature. From every obſervation which has been hitherto made on the powers and operations of the inferior animals, we are led to conſider them as guided and actuated chiefly, if not ſolely, by inſtinct, appetite, and ſenſation: their views extend not beyond the preſent moment; nor do they acquire new knowledge or prudence as they advance in life. But the character of the human race is much more exalted. We have alſo powers and organs of ſenſation, inſtincts and appetites; but theſe are the moſt ignoble parts of our nature: our rational faculties and moral powers elevate us above the brutes, and advance us to an alliance with ſuperior beings. Theſe rational faculties and moral powers render us capable of ſocial life, of artificial language, of art, of ſcience, and of religion. Now, were one of the ſpecies to come into the world full grown, poſſeſſed of that bodily ſtrength and vigour which diſtinguiſhes manhood, his ignorance would ſtill render him inadequate to the duties of life; nay, would even render him unable to procure means for his ſubſiſtence: while his manly appearance would deprive him of the compaſſion and benevolent aſſiſtance of others; and his ſtrength and vigour would alſo render him leſs docile and obedient than is neceſſary, in order that he may receive inſtruction in the duties and arts of life. Again, were the period of infancy as ſhort to the human ſpecies as to the other animals; were we to be no longer ſubjected to a parent's authority, or protected by his care, than the bird or the quadruped; we ſhould be expoſed to the dangers and difficulties of the world before we had acquired ſufficient knowledge or prudence to conduct us through them, before we had gained any acquaintance with the ordinary phenomena of nature, or were able to uſe the language or practiſe the arts of men in a ſocial ſtate.

Since, then, it is by the benevolence of nature that we are feeble and helpleſs at our entrance into life, and that our progreſs towards maturity is ſlow and gradual; ſince nature has deſtined us to be for a conſiderable time under the care and authority of our parents; and ſince the manner in which we are managed during that early part of life has ſo important an influence on our future character and conduct: it is therefore incumbent on parents to direct that tenderneſs, which they naturally feel for their offspring, in ſuch a manner as to ſecond the views of nature.

47 Dreſs of infants.

When children come into the world, inſtinct directs them to receive nouriſhment from the breaſt, and to claim attention to their pains and wants by crying. We attend to their ſigns, and ſtrive to render them as eaſy as we can. They are waſhed, clothed with ſuch garments as we think moſt ſuitable, and ſuckled either by their mother or by ſome other woman who is conſidered as proper for the purpoſe. The abſurd mode of ſwaddling up infants in ſuch a manner as to confine them almoſt from all motion, and leave ſcarce a limb at liberty, which has been ſo often exclaimed againſt and repreſented as highly injurious to the ſymmetry and vigour of the human frame, is now almoſt entirely laid aſide; and therefore we need not raiſe our voice againſt it. Still, however, there are certainly too many pins and bandages uſed in the dreſs of infants: theſe are unfavourable to the circulation of the blood, impede the growth, and often occaſion thoſe tears and that peeviſhneſs which we raſhly attribute to the natural ill-humour of the poor creatures. Their dreſs ought to be looſe and cool, ſo as to preſs hard on no joint, no vein nor muſcle; and to leave every limb at liberty. If too heavy and cloſe, it may occaſion too copious a perſpiration, and at the ſame time confine the matter perſpired on the ſurface of the ſkin; than which nothing can be more prejudicial to the health of the child. It may alſo, however, be too thin and cool: for as moderate warmth is neceſſary to the vegetation of plants; ſo it is no leſs neceſſary for promoting the growth of animals: and, therefore, though the dreſs of infants ought to be looſe and eaſy, yet ſtill it ſhould be moderately warm.

48 Nurſes.

It is common for mothers in affluent or even in comfortable circumſtances, to forego the pleaſure of nurſing their own children, that they may avoid the fatigues with which it is attended. This practice has long prevailed in various ages and among various nations: it has been often reprobated with all the warmth of paſſion, and all the vehemence of eloquence, as diſhonourable, inhuman, contradictory to the deſigns of nature. and deſtructive of natural affection: yet ſtill it prevails; fathers and mothers are ſtill equally deaf to the voice of nature and the declamations of philoſophers. Indeed, in a luxurious age, ſuch a practice may be naturally expected to prevail. In ſuch an age, they who are poſſeſſed of opulence generally perſuade themſelves, that, to be happy, is to ſpend their time wholly amid diverſions and amuſements, without deſcending to uſeful induſtry, or troubling themſelves about the ordinary duties of life. Influenced by ſuch notions, they think it proper for them to manage their family affairs, and to nurſe and educate their children, by proxy; nay, to do for themſelves nothing that another can perform for them. It is vain to make a furious oppoſition to theſe abſurd notions; the falſe views of happineſs, the pride and the indolence produced by luxury, will ſtill be too powerful for us. We muſt not hope to perſuade the mother, that to receive the careſſes, to behold the ſmiles, and to mark the bodily and mental powers of her child in their gradual progreſs towards maturity, would be more than a ſufficient compenſation for all the fatigues which ſhe would undergo in nurſing and watching over him in his infant years. We need not mention, that the mutual affection between a mother and her child, which is partly the effect of inſtinct, depends alſo, in no inconſiderable degree, on the child's ſpending the period of infancy in its mother's arms; and that when ſhe ſubſtitutes another in her place, the child naturally transfers its affection to the perſon who performs to it the duties of a mother. We need not urge theſe, nor the various other reaſons which ſeem to recommend to every mother the province of ſuckling her own children, and watching over their infant years; for we will either not be heard, or be liſtened to with contempt. Yet we may venture to ſuggeſt, that if the infant muſt be committed to a ſtranger, ſome degree of prudence may be employed in ſelecting the perſon to whom he is to be entruſted. Her health, her temper, and her manner of ſpeaking, muſt be attended to. A number of other qualifications are alſo to be required in a nurſe: but it is rather the buſineſs of the phyſician to give directions with regard to theſe. If her habit of body be any way unhealthy, the conſtitution of the infant that ſucks her milk cannot but be injured: if her temper be rough or peeviſh, the helpleſs child ſubjected to her power will be often harſhly treated; its ſpirit will be broken, and its temper ſoured: if her pronunciation be inarticulate or too rapid, the child may acquire a bad habit when it firſt begins to exert its vocal organs, which will not be eaſily corrected.

49
Influence of treatment in infancy on the abilities and diſpoſitions.

In the milder ſeaſons of the year, infants ought to be frequently carried abroad. Not only is the open air favourable to health, but the freſhneſs, the beauty, the variety, and the lively colours of the ſcenes of nature, have the happieſt effects on the temper, and have even a tendency to enliven and invigorate the powers of the mind. At this period, the faculties of the underſtanding and the diſpoſitions of the heart generally acquire that particular bias, and thoſe diſtinguiſhing features, which characterize the individual during the future part of his life, as quick or dull, mild or paſſionate; and which, though they be generally attributed to the original conformation of the mind by the hand of nature, yet are owing rather to the circumſtances in which we are placed, and the manner in which we are treated, during the firſt part of life.

When children begin to walk, our fondneſs diſpoſes us to adopt many expedients to aſſiſt them. But theſe ſeem to be improper. It is enough for us to watch over them ſo as to guard them from any danger which they might otherwiſe incur by their firſt attempts to move about. Thoſe who adviſe us not to be too anxious to preſerve children from thoſe ſlight hurts to which they are expoſed from their diſpoſition to activity, before they have acquired ſufficient ſtrength or caution, certainly give a judicious piece of advice which ought to be liſtened to. By being too attentive to them, we teach them to be careleſs of themſelves; by ſeeming to regard every little accident which befals them as a moſt dreadful calamity, we inſpire them with timidity, and prevent them from acquiring manly fortitude. When children begin to liſp out a few words or ſyllables, the pleaſure which we feel at hearing them aim at the uſe of our language, diſpoſes us to liſten to them with ſuch attention as to relieve them from the neceſſity of learning an open diſtinct articulation. Thus we teach them to expreſs themſelves in a rapid, indiſtinct, and heſitating manner, which we often find it difficult, ſometimes even impoſſible, to correct, when they are farther advanced. Would we teach them a plain diſtinct articulation, we ought not only to ſpeak plainly and diſtinctly in their preſence, but alſo to diſregard their queſtions and requeſts, if not expreſſed with all the openneſs and diſtinctneſs of pronunciation of which they are capable.

Man is naturally an imitative animal. Scarce any of our natural diſpoſitions is diſplayed at an earlier period than our diſpoſition to imitation. Childrens firſt amuſements are dramatic performances, imitative of the arts and actions of men. This is one proof among others, that even in infancy our reaſoning faculties begin to diſplay themſelves; for we cannot agree with ſome philoſophers, that children are actuated and guided ſolely by inſtinct in their attempts at imitation.

However that be, the happieſt uſe might be made of this principle which diſcovers itſelf ſo early in the infant mind. Whatever you wiſh the child to acquire, do in his preſence in ſuch a manner as to tempt him to imitate you. Thus, without ſouring his mind by reſtraint during this gay innocent period of life, you may begin even now to cultivate his natural powers. Were it impoſſible at this time to communicate any inſtruction to the boy, without baniſhing that ſprightly gaiety which naturally diſtinguiſhes this happy age, it would be beſt to think only how he might loſe his time in the leaſt diſadvantageous manner. But this is far from being neceſſary. Even now the little creature is diſpoſed to imitation, is capable of emulation, and feels a deſire to pleaſe thoſe whoſe kindneſs has gained his affection. Even now his ſentiments and conduct may be influenced by rewards when prudently beſtowed, and by puniſhments when judiciouſly inflicted. Why then ſhould we heſitate to govern him

Education.

ain by the ſame principles, by which the laws of God and ſociety aſſert their influence on our own ſentiments and conduct? Indeed, the imprudent manner in which children are too generally managed at this early period, would almoſt tempt us to think it impoſſible to inſtruct them, as yet, without injuring both their abilities and diſpoſitions. But this is owing ſolely to the careleſsneſs, ſtupidity, or capricious conduct of thoſe under whoſe care they are placed.

Is implicit obedience to be exacted of children? and at what period of life ſhould we begin to enforce it? As children appear to be capable both of reaſoning and of moral diſtinctions at a very early age; and as they are ſo weak, ſo inexperienced, ſo ignorant of the powers of ſurrounding bodies, and of the language, inſtitutions, and arts of men, as to be incapable of ſupporting or conducting themſelves without direction or aſſiſtance; it ſeems therefore proper that they be required even to ſubmit to authority. To the neceſſity of nature both they and we muſt on many occaſions ſubmit. But if the will of a parent or tutor be always found ſcarce leſs unalterable than the neceſſity of nature, it will always meet with the ſame reſpectful ſubmiſſive reſignation. It may not perhaps be always proper to explain to children the reaſons for which we require their obedience: becauſe, as the range of their ideas is much leſs extenſive than ours; as they do not well underſtand our language, or comprehend our modes of reaſoning; and as they are now and then under the influence of paſſion and caprice, as well as people who are farther advanced in life; we are therefore likely to fail in making them comprehend our reaſons, or in convincing them that they are well-grounded. And as it is proper to exact obedience of children; ſo we ſhould begin to require it as ſoon as they become capable of any conſiderable degree of activity. Yet we muſt not confine them like ſlaves, without allowing them to ſpeak, to look, or to move, but as we give the word. By ſuch treatment we could expect only to render them peeviſh and capricious. It will be enough, at firſt, if we let them know that obedience is to be hexacted; and if we reſtrain them only where, if left at liberty, they would be expoſed to imminent danger.

If then, at ſo early a time of life as before the age of five or ſix, it is poſſible to render children obedient, and to communicate to them inſtruction; what arts, or what learning, ought we to teach them at that period? To give a proper anſwer to this queſtion, is no eaſy matter. It ſeems at firſt difficult to determine, whether we ought yet to initiate them in letters. But as their apprehenſion is now quick, and their memory pretty tenacious, there cannot be a more favourable time for this very purpoſe. As ſoon as they are capable of a diſtinct articulation, and ſeem to poſſeſs any power of attention, we may with the greateſt propriety begin to teach them the alphabet. The moſt artful, alluring methods may be adopted to render the horn-book agreeable; or we may uſe the voice of authority, and command attention for a few minutes; but no harſhneſs, no ſeverity, and ſcarce any reſtraint. At the ſame time, it will be proper to allow the little creatures to run much about in the open air, to exerciſe their limbs, and to cultivate thoſe ſocial diſpoſitions which already begin to appear, by playing with their equals.

Such are the thoughts which have ſuggeſted themſelves to us concerning the management of children in mere infancy. What an amiable little creature would the boy or girl be, who were brought up in a manner not inconſiſtent with the ſpirit of theſe few hints? Behold him healthy and vigorous, mild, ſprightly, and cheerful: He is ſubmiſſive and docile, yet not dull or timid; he appears capable of love, of pity, and of gratitude. His mind is hitherto, however, almoſt wholly uninformed: he is acquainted but with a few of the objects around him; and knows but little of the language, manners, and inſtitutions of men: but he feels the impulſe of an ardent curioſity, and all the powers of his mind are alive and active.

### II. *On the Management of Children between the Age of five or ſix and the Age of puberty.*

At this period it may be proper, not only to exact obedience, and to call the child's attention for a few minutes now and then to thoſe things of which the knowledge is likely to be afterwards uſeful to him; but we may now venture to require of him a regular ſteady application, during a certain portion of his time, to ſuch things as we wiſh him to learn. Before this time it would have been wrong to confine his attention to any particular taſk. The attempt could have produced no other effect than to deſtroy his natural gaiety and cheerfulneſs, to blunt the native quickneſs of his powers of apprehenſion, and to render hateful that which you wiſhed him to acquire. Now, however, the caſe is ſomewhat different: The child is not yet ſenſible of the advantages which he may derive from learning to read, for inſtance; or even though he were able to foreſee all the advantages which he will obtain by ſkill in the art of reading through the courſe of life; yet is it the character of human nature, at every ſtage of life, to be ſo much influenced by preſent objects in preference to future views, that the ſenſe of its utility alone would not be ſufficient to induce him to apply to it. Even at the age of 12, of 20, of 50; nay, in extreme old age, when reaſon is become very perſpicacious, and the paſſions are mortified; ſtill we are unable to regulate our conduct ſolely by views of utility. Nothing could be more abſurd, therefore, than to permit the child to ſpend his time in fooliſh tricks, or in idleneſs, till views of utility ſhould prompt him to ſpend it in a different manner. No; let us begin early to habituate him to application and to the induſtrious exertion of his powers. By endowing him with powers of activity and apprehenſion, and rendering him capable of purſuing with a ſteady eye thoſe objects which attract his deſires, nature plainly points out to us in what manner we ought to cultivate his earlier years. Beſides, we can command his obedience, we can awaken his curioſity, we can rouſe his emulation, we can gain his affection, we can call forth his natural diſpoſition to imitation, and we can influence his mind by the hope of reward and the fear of puniſhment. When we have ſo many means of eſtabliſhing our authority over the mind of the boy without tyranny or uſurpation; it cannot ſurely be difficult, if we are capable of any moderation and prudence, to cultivate his powers by making him begin at this period to give regular application to ſomething that may afterwards be uſeful.

51
A knowledge of words and of things muſt be learnt at the ſame time.

And if the boy muſt now begin to dedicate ſome portion of his time regularly to a certain taſk, what taſk will be moſt ſuitable? Even that to which children are uſually firſt required to apply; continue teaching him to read. Be not afraid that his abilities will ſuffer from an attention to books at ſo early an age. Say not that it is folly to teach him words before he have gained a knowledge of things. It is neceſſary, it is the deſign of nature, that he ſhould be employed in acquiring a knowledge of things, and gaining an acquaintance with the vocal and written ſigns by which we denote them, at the ſame time. Theſe are intimately connected; the one leads to the other. When you view any object, you attempt to give it a name, or ſeek to learn the name by which men have agreed to diſtinguiſh it: in the ſame manner, when the names of ſubſtances or of qualities are communicated to us, we are deſirous of knowing what they ſignify. At the ſame time, ſo imperfect is the knowledge of nature which children can acquire from their own unaſſiſted obſervation, that they muſt have frequent recourſe to our aſſiſtance before they can form any diſtinct notions of thoſe objects and ſcenes which they behold. Indeed language cannot be taught, without teaching that it is merely a ſyſtem of ſigns, and explaining what each particular ſign is deſigned to ſignify. If, therefore, language is not only neceſſary for facilitating the mutual intercourſe of men, but is even uſeful for enabling us to obtain ſome knowledge of external nature, and if the knowledge of language has a natural tendency to advance our knowledge of things; to acquaint ourſelves with it muſt therefore be regarded as an object of the higheſt importance: it muſt alſo be regarded as one of the firſt objects to which we ought to direct the attention of children. But the very ſame reaſons which prove the propriety of making children acquainted with thoſe artificial vocal ſigns which we uſe to expreſs our ideas of things, prove alſo the propriety of teaching them thoſe other ſigns by which we expreſs theſe in writing. It is poſſible indeed, nay it frequently happens, that we attempt to inſtruct children in language in ſo improper a manner as to confound their notions of things, and to prevent their intellectual powers from making that improvement of which they are naturally capable: but it is alſo poſſible to initiate them in the art of reading, and in the knowledge of language, with better auſpices and happier effects. The knowledge of language may be conſidered as the key by which we obtain acceſs to all the ſtores of natural and moral knowledge.

52
Confinement, how far proper

Though we now agree to confine our pupil to a certain taſk, and have determined that his firſt taſk ſhall be to learn to read; yet we do not mean to require that he be confined to this taſk during the greateſt part of the day, or that his attention be ſeriouſly directed to no other object. To ſubject him to too ſevere reſtraint would produce the moſt unfavourable effects on his genius, his temper, and his diſpoſitions. It is in conſequence of the injudicious management of children, while they are ſometimes ſuffered to run riot, and at other times cruelly confined like priſoners or ſlaves; it is in conſequence of this, that we behold ſo many inſtances of peeviſhneſs, caprice, and invincible averſion to all ſerious application at this period of life. But were a due medium obſerved, were reſtraint duly tempered with liberty and indulgence, nothing would be more eaſy than to diſpoſe children to cheerful obedience, and to communicate to them inſtruction at this age. That part of their time which they are left to enjoy at liberty, they naturally dedicate to their little ſports. The favourite ſports of boys are generally active; thoſe of girls, ſedentary. Of each we may take advantage, to prepare them for the future employments of life. However, neither are the amuſements of boys invariably active, nor thoſe of girls always ſedentary; for, as yet, the manners and diſpoſitions of the two ſexes are diſtinguiſhed rather by habit or accident than by nature. The diſpoſition to activity which characterizes children, is no leſs favourable to health than to their improvement in knowledge and prudence; their active ſports have a tendency to promote their growth and add new vigour to their limbs. Perhaps, even at this time, children might be enticed to learn the elements of natural philoſophy and natural hiſtory amid their amuſements and ſports. Birds, butterflies, dogs, and other animals, are now favourite objects of their care; their curioſity is powerfully rouſed by the appearance of any ſtrange object; and many of the ſimpleſt experiments of natural philoſophy are ſo pleaſing, that they cannot fail to attract the attention even of thoſe who are leaſt under the influence of curioſity. Yet it would be improper to inſiſt on their attention to theſe things as a taſk: if we can make them regard them as amuſements, it will be well; if not, we muſt defer them to ſome happier ſeaſon. They might alſo, by proper management, be led to acquire ſome ſkill in the arts. They build mimic houſes, and fill them with ſuitable furniture; they conſtruct little boats, and ſail them; they will fence in little gardens, and cultivate them; and we even ſee them imitate all the labours of the huſbandman. Such is the pleaſure which man naturally feels in exerting his powers, and in acting with deſign. Let us encourage this diſpoſition. Theſe are the moſt ſuitable amuſements in which they can engage.

As the boy's attention to literary objects is ſtill ſuppoſed to be continued, he will ſoon be able to read with ſome correctneſs and facility. It becomes an object of importance, and of no ſmall difficulty, to determine what books are to be put into his hands, and in what manner his literary education is to be conducted. After the child is made acquainted with the names and powers of the letters, with their combination into ſyllables, and with the combination of theſe again into words, ſo that he can read with tolerable facility; it will be proper that the pieces of reading which are put into his hands be ſuch as are deſcriptive of the actions of men, of the ſcenes of external nature, and of the forms and characters of animals. With theſe he is already in ſome degree acquainted: theſe are the objects of his daily attention; beyond them the range of his ideas does not yet extend; and therefore other ſubjects will be likely to render his taſk diſagreeable to him. Beſides, our preſent object is to teach him words: in order to teach him words, we muſt let him know their ſignification; but till he have acquired a very conſiderable knowledge of language, till he have gained a rich fund of ſimple ideas, it will be impoſſible for him to read or to hear with underſtanding on any other ſubject but theſe. And let us not as yet be particularly ducion.

ticularly anxious to communicate to him religious or moral inſtruction, otherwiſe than by our example, and by cauſing him to act in ſuch a manner as we think moſt proper. Our great buſineſs at preſent is, to make him acquainted with our language, and to teach him in what manner we uſe it to expreſs our ideas. By his own obſervation, and by our inſtruction, he will ſoon become capable of comprehending all that we wiſh to communicate: But let us not be too haſty; the boy cannot long view the actions of mankind, and obſerve the economy of the animal and the vegetable world, without becoming capable of receiving both religious and moral inſtruction when judiciouſly communicated.

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As ſoon as the pupil can read and ſpell with tolerable facility, and has acquired ſufficient ſtrength of arm and fingers to hold a pen, it may be proper to initiate him in the art of writing. If this art is not made diſagreeable by the manner in which his application to it is required, he will learn it without difficulty. Childrens natural diſpoſition to imitate, particularly whatever depends on manual operation, renders this art peculiarly eaſy and pleaſing to them when they are not harſhly forced to apply to it, nor ſuffered to get into a habit of performing their taſk with haſte and negligence.

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It requires indeed the moſt cautious prudence, the niceſt delicacy, and the moſt artful addreſs, to prevail with children to give a cheerful and attentive application to any appointed taſk. If you are too ſtern and rigid in enforcing application, you may ſeemingly obtain your object: the child ſits motionleſs, and fixes his eye on his book or copy; but his attention you cannot command; his mind is beyond your reach, and can elude your tyranny; it wanders from the preſent objects, and flies with pleaſure to thoſe ſcenes and objects in which it has found delight. Thus you are diſappointed of your purpoſe; and, beſides, inſpire the child with ſuch averſion both to you and to thoſe objects to which you wiſh him to apply, that perhaps at no future period will he view learning otherwiſe than with diſguſt.

5
eneſs.

Again, gentleneſs, and the arts of inſinuation, will not always be ſucceſsful. If you permit the child to apply juſt when he pleaſes; if you liſten readily to all his pretences and excuſes; in ſhort, if you ſeem to conſider learning as a matter not of the higheſt importance, and treat him with kindneſs while he pays but little attention and makes but ſlow progreſs; the conſequences of your behaving to him in this manner will be ſcarce leſs unfavourable than thoſe which attend imprudent and unreaſonable ſeverity. It is, however, ſcarce poſſible to give particular directions how to treat children ſo as to allure them to learning, and at the ſame time to command their ſerious attention. But the prudent and affectionate parent and the judicious tutor will not be always unſucceſsful; ſince there are ſo many circumſtances in the condition of children, and ſo many principles in their nature, which ſubject them to our will.

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The principles of arithmetic ought to make a part in the boy's education as ſoon as his reaſoning powers appear to have attained ſuch ſtrength and quickneſs that he will be able to comprehend them. Arithmetic affords more exerciſe to the reaſoning powers of the mind than any other of thoſe branches of learning to which we apply in our earlier years: and if the child's attention be directed to it at a proper period, if he be allowed to proceed ſlowly, and if care be taken to make him comprehend fully the principles upon which each particular operation proceeds, it will contribute much to increaſe the ſtrength and the acuteneſs of the powers of his underſtanding.

Education.

Where the learned languages are regarded as an object worthy of attention, the boy is generally initiated in them about this time, or perhaps earlier. We have reſerved to a ſeparate head the arguments which occur to us for and againſt the practice of inſtructing children in the dead languages; and ſhall therefore only obſerve in this place, that the ſtudy of them ought not to engroſs the learner's attention ſo entirely as to exclude other parts of education.

58
Practical mathematics.

From arithmetic our pupil may proceed to the practical branches of the mathematics: And in all of theſe, as well as in every other branch of learning, what you teach him will be beſt remembered and moſt thoroughly underſtood, if you afford him a few opportunities of applying his leſſons to real uſe in life. Geometry and geography are two moſt important branches of education; but are often taught in ſuch a manner, that no real benefit is derived from the knowledge of them. The means which Rouſſeau propoſes for initiating young people in theſe and in ſeveral other of the arts and ſciences are excellent; and if judiciouſly applied, could hardly fail of ſucceſs.

While boys are engaged in theſe and in the languages, they may alſo attend to and cultivate the bodily exerciſes; ſuch as dancing, fencing, and horſemanſhip. Each of theſe exerciſes is almoſt abſolutely neceſſary for one who is deſigned to have intercourſe with the world; and beſides, they have a tendency to render the powers of the body active and vigorous, and even to add new courage and firmneſs to the mind.

59
Firſt exerciſes in compoſition.

When our pupil has acquired ſome knowledge of his own and of the learned languages, has gained ſome ſkill in the principles of arithmetic and of practical mathematics, and has received ſome inſtruction in the principles of morality and religion, or even before this time, it will be proper to begin him to the practice of compoſition. Themes, verſions, and letters, the firſt exerciſes in compoſition which the boy is uſually required to perform, none of them ſeems happily calculated for leading him to increaſe his knowledge, or to acquire the power of expreſſing himſelf with eaſe and elegance. Without enlarging on the impropriety or abſurdity of theſe exerciſes, we will venture to propoſe ſomething different, which we cannot help thinking would conduce more effectually to the end in view. It has been already obſerved, that the curioſity of children is amazingly eager and active, and that every new object powerfully attracts their regard: but they cannot view any object without taking notice of its moſt obvious qualities; any animal, for inſtance, without taking notice of its ſhape, its colour, its ſeeming mildneſs or ferocity; and they are generally pretty ready to give an account of any thing extraordinary which they have obſerved. How eaſy then would it be to require them to write down an account of any new object expoſed to their obſervation?

tion? The taſk would not be difficult; and every new piece of compoſition which they preſented to us would add ſo much to their knowledge of nature. We might even require ſuch ſpecimens of their accuracy of obſervation and ſkill in language, at times when they enjoyed no opportunities of beholding new or ſurpriſing objects; a tree, a flower, a field, a houſe, an animal, any other ſimple object, ſhould be the ſubject of their exerciſe. After ſome time, we might require them to deſcribe ſomething more various and complex. They might give an account of ſeveral objects placed in a relative ſituation; as, a ſtream, and the vale through which it flows; or, a bird, and the manner in which it conſtructs its neſt; or, of one object ſucceſſively aſſuming various appearances, as the bud, the flower, the apple. Human actions are daily expoſed to their obſervation, and powerfully attract their attention. By and by, therefore, their taſk ſhould be to deſcribe ſome action which had lately paſſed in their preſence. We need not purſue this hint farther; but, if we miſtake not, by theſe means young people might ſooner, and much more certainly, be taught to expreſs themſelves with eaſe and correctneſs in writing, than by any of the exerciſes which they are at preſent cauſed to perform with a view to that. Beſides, they would at the ſame time acquire much more real knowledge. The ſtudy of words would then be rendered truly ſubſervient to their acquiring a knowledge of things.

We cannot deſcend to every particular of that ſeries of education in which we wiſh the boy to be engaged from that period when he firſt becomes capable of ſerious application till he reach the age of puberty. It is not neceſſary that we ſhould, after having given abſtracts of what has been offered to the world by ſo many reſpectable writers on the ſubject.

The few hints which we have thrown out will be ſufficient to ſhow, in general, in what manner we wiſh the youth's education to be conducted during this period. Let the parent and the tutor bear in mind, that much depends on their example, with regard to the diſpoſitions and manners of the youth; and let them carefully ſtrive to form him to gentleneſs, to firmneſs, to patient induſtry, and to vigorous courage: let them, if poſſible, keep him at a diſtance from that contagion with which the evil example of worthleſs ſervants and play-fellows will be likely to infect him. Now is the time for ſowing the ſeeds of piety and virtue: if carefully ſown now, they will ſcarce fail to grow up, and bear fruit in future life.

### III. *From Puberty to Manhood.*

This age is every way a very important period in human life. Whether we conſider the change which now takes place in the bodily conſtitution, or the paſſion which now firſt begins to agitate the breaſt, ſtill we muſt regard this as a critical ſeaſon to the youth. The buſineſs of thoſe to whoſe care he is ſtill entruſted, is to watch over him ſo as to prevent the paſſion for the ſex from hurrying him to ſhameful and vicious indulgence, and from ſeducing him to habits of frivolity and indolence; to prevent him from becoming either the ſhameleſs rake, or the trifling coxcomb. Though ſo furious is the impulſe of that appetite which now fires the boſom and ſhoots through the veins of the youth, that to reſtrain him from the exceſſes to which it leads can be no eaſy taſk; yet if his education has been hitherto conducted with prudence, if he is fond of manly exerciſes, active, ſober, and temperate, and ſtill influenced by modeſty and the ſenſe of ſhame; even this may through the bleſſing of heaven be accompliſhed. It is impoſſible to give better directions than thoſe of Rouſſeau for this purpoſe. Let the young man know his ſituation; ſet before him in a ſtriking light the virtue which he may practiſe by reſtraining appetite, and the frightful fatal vices into which he may be hurried. But truſt not to precept, nor to any views which you can lay before him, either of the diſgracefulneſs and the pernicious conſequences of vice, or of the dignity and the happy fruits of virtue. Something more muſt be done. Watch over him with the attention of an Argus; engage him in the moſt active and fatiguing ſports. Carefully keep him at a diſtance from all ſuch company, and ſuch books, as may ſuggeſt to his mind ideas of love, and of the gratification at which it aims. But ſtill all your precautions will not counteract the deſigns of nature; nor do you wiſh to oppoſe her deſigns. The youth under your care muſt feel the impulſe of deſire, and become ſuſceptible of love. Let him then fix his affections on ſome virtuous young woman. His attachment to her will raiſe him above debauchery, and teach him to deſpiſe brutal pleaſures: it will operate as a motive to diſpoſe him to apply to ſuch arts, and to purſue ſuch branches of knowledge, as may be neceſſary for his farther eſtabliſhment in the world. The good ſenſe of Rouſſeau on this head renders it leſs neceſſary for us to enlarge on it; eſpecially as we are to treat of ſome articles ſeparately which regard the management of youth at this period.

### IV. *Religion and Morals.*

In pointing out the general plan of education which appears to us the moſt proper to be purſued in order to form a virtuous and reſpectable member of ſociety, we took but ſlight notice of the important objects of religion and morals. At what period, and in what manner, ought the principles of religion and morality to be inſtilled into the youthful mind? It has been before obſerved, that children are capable of reaſoning and of moral diſtinctions even at a very early age. But they cannot then comprehend our reaſonings, nor enter into our moral diſtinctions; becauſe they are ſtrangers to our language, and to the artificial manner in which we arrange our ideas when we expreſs them in converſation or in writing. It follows, then, that as ſoon as they are ſufficiently acquainted with our language, it muſt be proper to communicate to them the principles and precepts of morality and religion. Long before this time, they are diligent and accurate obſervers of human actions. For a ſhort period it is merely the external act which they attend to and obſerve: ſoon, however, they penetrate farther; conſcious themſelves of reflection and volition, they regard us alſo as thinking beings; conſcious of benevolent and of unfriendly diſpoſitions, they regard us as acting with deſign, and as influenced by paſſion: naturally imitative animals, they are diſpoſed in their conduct to follow the example which we ſet before them. By our example we may teach them piety and virtue long before it can be proper to offer them religious or moral inſtruction in a formal manner.

We

We cannot preſume to determine at what particular period children ought to be firſt informed of their relations to God and to ſociety, and of the duties incumbent on them in conſequence of thoſe relations. That period will be different to different children, according to the pains which have been taken, and the means which have been employed, in cultivating their natural powers. Perhaps even where the moſt judicious maxims of education have been adopted, and have been purſued with the happieſt effects, it cannot be ſooner than the age of eight or nine. But even before this period much may be done. Show the child your reverence for religion and virtue; talk in his preſence, and in the plaineſt, ſimpleſt terms, though not directly to him, of the exiſtence of God the creator, the preſerver, and the governor of the world; ſpeak of the conſtant dependance of every creature on the gracious care of that Being; mention with ardour the gratitude and obedience which we owe to him as our great parent and beſt benefactor: next, ſpeak of the mutual relations of ſociety; of the duties of children and parents, of maſters and ſervants, of man to man. At length, when his mind is prepared by ſuch diſcourſes which have paſſed in his preſence without being addreſſed to him, you may begin to explain to him in a direct manner the leading doctrines of religion. He will now be able to comprehend you, when you addreſs him on that important ſubject: the truths which you communicate will make a powerful impreſſion on his mind; an impreſſion which neither the corruption and diſſipation of the world, nor the force of appetite and paſſion, will ever be able to efface.

61 bit. Some writers on this ſubject have aſſerted, that youth are incapable of any juſt ideas of religion till they attain a much more advanced age; and have inſiſted, that, for this reaſon, no attempts ſhould be made to communicate to them the articles of our creed in their earlier years. This doctrine, both from its novelty and from its pernicious tendency, has provoked the keeneſt oppoſition. It has, however, been oppoſed rather with keenneſs than with acuteneſs or ſkill. Its opponents ſeem to have generally allowed that children are incapable of reaſoning and of moral diſtinctions; but they have aſcribed wonderful effects to habit. Enrich the memories of children, ſay they, with the maxims of morality, and with the doctrines of religion; teach them prayers, and call them to engage in all the ordinances of religion. What though they comprehend not the meaning of what they learn? What though they underſtand not for what purpoſe you bid them repeat their prayers, nor why you confine them on the Lord's day from their ordinary amuſements? Their powers will at length ripen, and they will then ſee in what they have been employed, and derive the higheſt advantage from the irkſome taſks to which you confined them. You have formed them to habits which they will not be able to lay aſide: After this they cannot but be religious at ſome period of life, even though you have inſpired them with a diſguſt for the exerciſes of religion. Thoſe good people have alſo talked of the priniciple of *the aſſociation of ideas.* As no man ſtands alone in ſociety, ſay they; ſo no one idea exiſts in the mind ſingle and unconnected with others: as you are connected with your parents, your children, your friends, your countrymen; ſo the idea of a tree, for inſtance, is connected with that of the field in which it grows, of the fruit which it bears, and of contiguous, diſſimilar, and reſembling objects. When any one ſet of related ideas have been often preſented to the mind in connection with one another, the mind at length comes to view them as ſo intimately united, that any particular one among them never fails to introduce the reſt. Reviſit the ſcenes in which you ſpent your earlieſt years; the ſports and companions of your youth naturally ariſe to your recollection. Have you applied to the ſtudy of the claſſics with reluctance and conſtraint, and ſuffered much from the ſeverity of parents and tutors for your indifference to Greek and Latin? you will, perhaps, never through the courſe of life ſee a grammar ſchool, without recollecting your ſufferings, nor look on a Virgil or Homer without remembering the ſtripes and confinement which they once occaſioned to you. In the ſame manner, when religious principles are impreſſed on the mind in infancy in a proper manner, an happy aſſociation is formed which cannot fail to give them a powerful influence on the ſentiments and conduct in future life. But if we have advanced to manhood before being informed of the exiſtence of a Deity, and of our relation to him; the principles of religion, when communicated, no longer produce the ſame happy effects: the heart and the underſtanding are no longer in the ſame ſtate; nor will the ſame aſſociations be formed.

62 Dr Prieſtley's opinion concerning aſſociation of *ideas.*

This doctrine of *the aſſociation of ideas* has been adduced by an ingenious writer, diſtinguiſhed for his diſcoveries in natural philoſophy, and for his labours in controverſial divinity, as an argument in behalf of the propriety of inſtructing youth in the principles of religion even in their earlieſt years. We admire, we eſteem, the ſpirit which has prompted him to diſcover ſo much concern for the intereſts of the riſing generation; but at the ſame time we will not conceal our opinion, that even this argument ought to be urged with caution. Many of the phenomena of human nature may indeed be explained, if we have recourſe to the principle of *aſſociation.* The influence of any principle, religious or moral, depends in a great meaſure on the ideas and images which, in conſidering it, we have been accuſtomed to aſſociate with it in our minds. But what are the ideas or images moſt likely to be aſſociated by children with the doctrines and duties of religion, if we call them to liſten to the one and perform the other at too early a period? Will they be ſuch as may aſſiſt the influence of religion on their ſentiments and conduct in the future part of life? Obſerve the world: Are thoſe who, in infancy, have been moſt rigidly compelled to get their catechiſms by rote, either the moſt pious or the beſt informed in religious matters? Indeed, when we conſider what has been ſaid of the influence of habit, and of the aſſociation of ideas, we cannot help thinking, that any arguments which on the preſent occaſion may be adduced from either of theſe, tend directly to prove, not that we ought to pour in religious inſtruction into the minds of children, without conſidering whether they be qualified to receive it; but, on the contrary, that we ought cautiouſly to wait for and catch the proper ſeaſon;—that ſeaſon when the youthful mind, no longer a ſtranger to our language, our ſentiments, our views of nature, or our manner of reaſoning, will be able to go along with us, when we talk to him of a ſupreme Being, of our condition as dependant and accountable creatures, of truth, benevolence, and juſtice.

We flatter ourſelves, then, that our readers will readily agree with us, 1ſt, That the moral and reaſoning powers of children begin to diſplay themſelves at a very early age, even in infancy. 2dly, That as ſoon as they have made themſelves acquainted with the moſt obvious appearances of nature, and have gained a tolerable knowledge of our language and our manner of arranging our ideas in reaſoning, we may with the greateſt propriety begin to inſtruct them in the principles of religion. 3dly, That the moſt careful and judicious obſervation is neceſſary to enable us to diſtinguiſh the period at which children become capable of receiving religious inſtruction; becauſe, if we either attempt to communicate to them theſe important truths too early, or defer them till towards manhood, we may fail of accompliſhing the great end which we have in view.

63
Catechiſms.

If we can be ſo fortunate as to chooſe the happieſt ſeaſon for ſowing the firſt ſeeds of piety in the infant mind, our next care will be to ſow them in a proper manner. We muſt anxiouſly endeavour to communicate the principles of religion and morality, ſo as they may be eaſieſt comprehended by the underſtanding of the learner, and may make the deepeſt impreſſion on his heart. It would be a matter of the greateſt difficulty to give particular directions on this head. The diſcretion of the parent or tutor muſt here be his guide. We are afraid that ſome of the catechiſms commonly taught are not very happily calculated to ſerve the purpoſe for which they are intended. Yet we do not wiſh that they ſhould be neglected while nothing more proper is introduced in their room. In inſtructing children in the firſt principles of religion, we muſt beware of arraying piety in the gloomy garb, or painting her with the forbidding features, in which ſhe has been repreſented by anchorites, monks, and puritans. No; let her aſſume a pleaſing form, a cheerful dreſs, and an inviting manner. Deſcribe the Deity as the affectionate parent, the benefactor, and though the impartial yet the merciful judge of mankind. Exhibit to them Jeſus Chriſt, the generous friend and ſaviour of the poſterity of Adam, who with ſuch enchanting benevolence hath ſaid, "Suffer little children to come unto me." Repreſent to them his yoke as eaſy, and his burden as light. Inſiſt not on their ſaying long prayers or hearing tedious ſermons. If poſſible, make the doctrines of religion to appear to them as glad tidings, and its duties as the moſt delightful of taſks.

## V. *The Languages.*

64
Prejudice againſt cl ſical educ tion.

Is the time uſually ſpent in learning the languages uſefully occupied? What advantages can our Britiſh youth derive from an acquaintance with the languages and the learning of Greece and Rome? Would we liſten to many of the fathers, the mothers, and the polite tutors of the preſent age, they will perſuade us, that the time which is dedicated to grammar-ſchools, and to Virgil, Cicero, Homer, and Demoſthenes, is fooliſhly thrown away; and that no advantages can be gained from the ſtudy of claſſical learning. They wiſh their children and pupils to be not merely ſcholars; they wiſh them to acquire what may be uſeful and ornamental when they come to mingle with the world; and for this purpoſe, they think it much better to teach their young people to ſmatter out French, to dance, to fence, to appear in company with invincible aſſurance, and to dreſs in ſuch a manner as may attract the attention of the ladies. Beſides, the tenderneſs and humanity of thoſe people are amazing. They are ſhocked at the idea of the ſufferings which boys undergo in the courſe of a claſſical education. The confinement, the ſtripes, the harſh language, the burdens laid on the memory, and the pain occaſioned to the eyes, during the dreary period ſpent in acquiring a knowledge of Greek and Latin, affect them with horror when they think of them as inflicted on children. They therefore give the preference to a plan of education in which leſs intenſe application is required and leſs ſeverity employed.

65
Prejudice for it.

But, again, there are others who are no leſs warm in their eulogiums on a claſſical education, and no leſs induſtrious in recommending the ſtudy of Greek and Latin, than thoſe are eager in their endeavours to draw neglect on the poliſhed languages of antiquity. With this ſecond claſs, if an adept in Greek and Latin, you are a great and learned man; but without thoſe languages, contemptible for ignorance. They think it impoſſible to inſpire the youthful mind with generous or virtuous ſentiments, to teach the boy wiſdom, or to animate him with courage, without the aſſiſtance of the ancient philoſophers, hiſtorians, and poets. Indeed their ſuperſtitious reverence for the ancient languages, and for thoſe writers whoſe compoſitions have rendered Greece and Rome ſo illuſtrious, leads them to aſcribe many other ſtill more wonderful virtues to a claſſical education.

With which of theſe parties ſhall we join? or ſhall we mediate between them? Is it improper to call youth to the ſtudy of the languages? Is it impoſſible to communicate any uſeful knowledge without them? Or are they, though highly uſeful, yet not always indiſpenſably neceſſary?

66
Utility of claſſical learning t wards the improvement of our moth tongue.

We have formerly taken notice of one circumſtance in favour of a claſſical education, to which it may be proper to recal the attention of our readers. We obſerved, that the cultivation of claſſical learning has a favourable influence on the living languages. It has a tendency to preſerve their purity from being debaſed, and their analogy from becoming irregular. In ſtudying the dead languages, we find it neceſſary to pay more attention to the principles of grammar than in acquiring our mother-tongue. We learn our native language without attending much to its analogy and ſtructure. Of the numbers who ſpeak Engliſh through the Britiſh dominions, but few are ſkilled in the inflexion of its nouns and verbs, or able to diſtinguiſh between adverbs and conjunctions. Deſirous only of making their meaning underſtood, they are not anxious about purity or correctneſs of ſpeech. They reject not an expreſſion which occurs to them, becauſe it is barbarous or ungrammatical. As they grew up they learned to ſpeak from their mothers, their nurſes, and others about them: they were ſoon able to make known their wants, their wiſhes, and their obſervations,

tions, in words. Satisfied with this, or called at a very early period to a life of humble induſtry, they have continued to expreſs themſelves in their mother-tongue without acquiring any accurate knowledge of its general principles. If theſe people find occaſion to expreſs themſelves in writing, they are ſcarce more ſtudious of correctneſs and elegance in writing than in ſpeaking; or, though they may aſpire after thoſe properties, yet they can never attain them. But ſuch writers or ſpeakers can never refine any language, or reduce it to a regular analogy. Neither can they be expected to diſtinguiſh themſelves as the guardians of the purity and regularity of their native tongue, if it ſhould before have attained an high degree of perfection. But they who, in learning a language different from their native tongue, have found it neceſſary to pay particular attention to the principles of grammar, afterwards apply the knowledge of grammar which they have thus acquired in uſing their mother-tongue; and by that means become better acquainted with its ſtructure, and learn to write and ſpeak it with more correctneſs and propriety. Beſides, the languages of Greece and Rome are ſo highly diſtinguiſhed for their copiouſneſs, their regular analogy, and for various other excellencies, which render them ſuperior to even the chief of modern languages, that the ſtudy of them has a natural tendency to improve and enrich modern languages. If we look backwards to the 15th century, when learning began to revive in Europe, and that ſpecies of learning which began firſt to be cultivated was claſſical literature, we find that almoſt all the languages then ſpoken in Europe were wretchedly poor and barbarous. Knowledge could not be communicated, nor buſineſs tranſacted, without calling in the aid of Latin. Claſſical learning, however, ſoon came to be cultivated by all ranks with enthuſiaſtic eagerneſs. Not only thoſe deſigned to purſue a learned profeſſion, and men of fortune whoſe object was a liberal education without a view to any particular profeſſion; but even the lower ranks, and the female ſex, keenly ſtudied the languages and the wiſdom of Greece and Rome. This avidity for claſſical learning was followed by many happy effects. But its influence was chiefly remarkable in producing an amazing change on the form of the living languages. Theſe ſoon became more copious and regular; and many of them have conſequently attained ſuch perfection, that the poet, the hiſtorian, and the philoſopher, can clothe their thoughts in them to the greateſt advantage. Could we derive no new advantage from the ſtudy of the ancient languages, yet would they be worthy of our care, as having contributed ſo much to raiſe the modern languages to their preſent improved ſtate. But they can alſo conduce to the preſervation and ſupport of thoſe noble ſtructures which have been reared by their aſſiſtance. The intercourſe of nations, the affectation of writers, the gradual introduction of provincial barbariſms, and various other cauſes, have a tendency to corrupt and debaſe even the nobleſt languages. By ſuch means were the languages of Greece and Rome gradually corrupted, till the language uſed by a Horace, a Livy, a Xenophon, and a Menander, was loſt in a jargon unfit for the purpoſes of compoſition. But if we would not diſdain to take advantage of them, the claſſical works in thoſe languages might prevent that which we uſe from experiencing ſuch a decline. He who knows and admires the excellencies of the ancient languages, and the beauties of thoſe writers who have rendered them ſo celebrated, will be the firm enemy of barbariſm, affectation, and negligence, whenever they attempt to debaſe his mother-tongue. We venture therefore to aſſert, that when the poliſhed languages of antiquity ceaſe to be ſtudied among us, our native tongue will then loſe its purity, regularity, and other excellencies, and gradually decline till it be no longer known for the language of Pope and of Addiſon; and we adduce it as an argument in behalf of claſſical learning, that it has contributed ſo much to the improvement of the living languages, and is almoſt the only means that can prevent them from being corrupted and debaſed.

67
For inuring to induſtry.

In thoſe plans of education of which the ſtudy of the dead languages does not make a part, proper means are ſeldom adopted for impreſſing the youthful mind with habits of induſtry: nor do the judgment, the memory, and the other powers of the mind, receive equal improvement, as they paſs not through the ſame exerciſes as in a claſſical education. Let us enter thoſe academies where the way to a complete education leads not through the thorny and rugged paths of claſſical literature; let us attend to the exerciſes which the polite teachers cauſe their pupils to perform. Do they inſiſt on laborious induſtry or intenſe application? No; they can communicate knowledge without requiring laborious ſtudy. They profeſs to allow their pupils to enjoy the ſweets of idleneſs, and yet render them prodigies of learning. But are their magnificent promiſes ever fulfilled? Do they indeed cultivate the underſtandings of the young people intruſted to their care? They do not: their care is never once directed to this important object. To adorn them with ſhowy and ſuperficial qualities, is all that thoſe gentlemen aim at. Hence, when their pupils come to enter the world and engage in the duties of active life, they appear deſtitute of every manly qualification. Though they have attained the age and grown up to the ſize of manhood, their underſtandings are ſtill childiſh and feeble: they are capricious, unſteady, incapable of induſtry or fortitude, and unable to purſue any particular object with keen, unremitting perſeverance. That long ſeries of ſtudy and regular application, which is requiſite in order to attain ſkill in the ancient languages, produces much happier effects on the youthful mind. The power of habit is univerſally felt and acknowledged. As he who is permitted to trifle away the earlieſt part of his life in idleneſs or in frivolous occupations, can ſcarce be expected to diſplay any manly or vigorous qualities when he reaches a more mature age; ſo, on the contrary, he whoſe earlier days have been employed in exerciſing his memory and furniſhing it with valuable treaſures, in cultivating his judgment and reaſoning powers by calling the one to make frequent diſtinctions between various objects, and the other to deduce many inferences from the compariſon of the various objects preſented to the underſtanding, and alſo in ſtrengthening and improving the acuteneſs of his moral powers by attending to human actions and characters, and diſtinguiſhing between them, as virtuous or vicious, as mean or glorious: he who has thus cultivated his powers, may be naturally expected to diſtinguiſh himſelf when he comes to perform his part in active life, by prudence, activity, firmneſs, perſeverance, and moſt of the other noble qualities which can adorn a human character. But in the courſe of a claſſical education, the powers of the mind receive this cultivation; and therefore theſe happy effects may be expected to follow from it. The repetitions which are required afford improving exerciſe to the memory, and ſtore it with the moſt valuable treaſures: the powers of the underſtanding are employed in obſerving the diſtinctions between words; in tracing words to the ſubſtances and qualities in nature which they are uſed to repreſent; in comparing the words and idioms of different languages, and in tracing the laws of their analogy and conſtruction; while our moral faculties are at the ſame time improved, by attending to the characters which are deſcribed, and the events and actions which are related, in thoſe books which we are directed to peruſe in order to acquire the ancient languages. We aſſert therefore, that the ſtudy of the ancient languages is particularly uſeful for improving and ſtrengthening all the powers of the mind; and, by that means, for preparing us to act our part in life in a becoming manner: and this our readers will readily agree with us in conſidering as a weighty argument in behalf of that plan of education.

68
Fund of uſeful and elegant knowledge which ancient authors afford.

But if, after all, claſſical learning is ſtill to be given up, where ſhall we find the ſame treaſures of moral wiſdom, of elegance, and of uſeful hiſtorical knowledge, which the celebrated writers of Greece and Rome afford? Will you content yourſelf with the modern writers of Italy, France, and England? Or will you deign to ſurvey the beauties of Homer and Virgil through the medium of a tranſlation? No ſurely; let us penetrate to thoſe ſources from which the modern writers have derived moſt of the excellencies which recommend them to our notice; let us diſdain to be impoſed upon by the whims or the ignorance of a tranſlator.

*Juvat integros accedere fontes.*

Farther, claſſical learning has long been cultivated among us; and both by the ſtores of knowledge which it has conveyed to the mind, and the habits which it has impreſſed, has contributed in no ſmall degree to form many illuſtrious characters. In reviewing the annals of our country, we will ſcarce find an eminent politician, patriot, general, or philoſopher, during the two laſt centuries, who did not ſpend his earlier years in the ſtudy of the claſſics.

Yet though we have mentioned theſe things in favour of claſſical literature, and were we to deſcend to minute particulars might enumerate many more facts and circumſtances to recommend it; we mean not to argue that it is abſolutely impoſſible to be a wiſe, a great, or a good man, unleſs you are ſkilled in Greek and Latin. Means may, no doubt, be adopted to inſpire the young mind with virtuous diſpoſitions, to call forth the powers of the youthful underſtanding, and to impreſs habits of induſtry and vigorous perſeverance, without having recourſe to the diſcipline of a grammar ſchool. But we cannot help thinking, for the reaſons which we have ſtated to our readers, that a claſſical education is the moſt likely to produce theſe happy effects.

As we are afterwards to take particular notice of the courſe of education moſt ſuitable for thoſe who are to occupy the humble ſtations in ſociety, we ſhall not here inquire whether it be proper to introduce them to an acquaintance with the Greek and Latin claſſics.

### VI. *On the Education of People of Rank and Fortune.*

69
Duties o people rank.

THOSE whom the kindneſs of Providence has placed in an elevated ſtation, and in affluent circumſtances, ſo that they ſeem to be born rather to the enjoyment of wealth and honours than to act in any particular profeſſion or employment, have notwithſtanding a certain part aſſigned them to perform, and many important duties to fulfil. They are members of ſociety, and enjoy the protection of the civil inſtitutions of that ſociety to which they belong; they muſt therefore contribute what they can to the ſupport of thoſe inſtitutions. The labours of the induſtrious poor are neceſſary to ſupply them with the luxuries of life; and they muſt know how to diſtribute their wealth with prudence and generoſity among the poor. They enjoy much leiſure; and they ought to know how to employ their leiſure hours in an innocent and agreeable manner. Beſides, as their circumſtances enable them to attract the regard and reſpect of thoſe who are placed in inferior ſtations, and as the poor are ever ready to imitate the conduct of their ſuperiors; it is neceſſary that they endeavour to adorn their wealth and honours by the moſt eminent virtues, in order that their example may have an happy influence on the manners of the community.

Their education ought therefore to be conducted with a view to theſe ends. After what we have urged in favour of a claſſical education, our readers will naturally preſume that we regard it as highly proper for a man of fortune. The youth who is deſtined to the enjoyment of wealth and honours, cannot ſpend his earlier years more advantageouſly than in gaining an acquaintance with the elegant remains of antiquity. The benefits to be derived from claſſical learning are peculiarly neceſſary to him. Care muſt be taken to preſerve him from acquiring an haughty, fierce, imperious temper. The attention uſually paid to the children of people of fortune, and the fooliſh fondneſs with which they are too often treated, have a direct tendency to inſpire them with high notions of their own importance, and to render them paſſionate, overbearing, and conceited. But if their temper acquire this bias even in childhood, what may be expected when they advance towards manhood, when their attention is likely to be oftener turned to the dignity and importance of that rank which they occupy, and to the pitiful humility of thoſe beneath them? Why, they are likely to be ſo proud, inſolent, reſentful, and revengeful, as to render themſelves diſagreeable and hateful to all who know them; and beſides, to be incapable of thoſe delightful feelings which attend humane, benevolent, and mild diſpoſitions. Let the man of fortune, therefore, as he is concerned for the future happineſs and dignity of his child, be no leſs careful to prevent him from being treated in ſuch a manner as to be inſpired with haughtineſs, caprice, and inſolence, than to prevent his mind from being ſoured by harſh and tyrannical uſage.

70
How to form the temper o a young man of f tune.

The manly exerciſes, as they are favourable to the health, the ſtrength, and even the morals; ſo they are highly

highly worthy of engaging the attention of the young gentleman. Dancing, fencing, running, horſemanſhip, the management of the muſket, and the motions of military diſcipline, are none of them unworthy of occupying his time, at proper ſeaſons. It is unneceſſary to point out the advantages which he may derive from dancing; theſe ſeem to be pretty generally underſtood. Perhaps our men of fortune would be aſhamed to make uſe of their legs for running; but occaſions may occur, on which even this humble accompliſhment may be uſeful. Though we wiſh not to ſee the young man of fortune become a jockey; yet to be able to make a graceful appearance on horſeback, and to manage his horſe with dexterity, will not be unworthy of his ſtation and character. If times of public danger ſhould ariſe, and the ſtate ſhould call for the ſervices of her ſubjects againſt any hoſtile attack, they whoſe rank and fortune place them in the moſt eminent ſtations will be firſt expected to ſtand forth; but if unacquainted with thoſe exerciſes which are connected with the military art, what a pitiful figure muſt they make in the camp, or on the field of battle?

71
aw.

As the man of fortune may perhaps enjoy by hereditary right, or may be called by the voice of his fellow-citizens, to a ſeat among the legiſlative body of his country; he ought in his youth to be carefully inſtructed in the principles of her political conſtitution, and of thoſe laws by which his own rights and the rights of his fellow-citizens are determined and ſecured.

72
loſophy.

Natural philoſophy, as being both highly uſeful and entertaining, is well worthy of the attention of all who can afford to appropriate any part of their time to ſcientific purſuits; to the man of fortune, a taſte for natural philoſophy might often procure the moſt delightful entertainment. To trace the wonders of the planetary ſyſtems, to mark the proceſs of vegetation, to examine all the properties of that fine element which we breathe, to trace the laws by which all the different elements are confined to their proper functions, and above all to apply the principles of natural philoſophy in the cultivation of the ground, are amuſements which might agreeably and innocently occupy many of the leiſure hours of the man who enjoys a ſplendid and independent fortune.

73
and
als.

Neither do we ſuppoſe civil hiſtory and the principles of morals to be overlooked. Without being acquainted with theſe, how could any juſt or accurate knowledge of the laws and political conſtitution of his country be acquired by the young gentleman? Hiſtory expoſes to our obſervation the fortune and the actions of other human beings, and thus ſupplies in ſome meaſure the place of experience; it teaches prudence, and affords exerciſe to the moral ſenſe. When hiſtory condeſcends to take notice of individuals, they are almoſt always ſuch as have been eminent for virtue, for abilities, or for the rank which they held in life; to the rich and great it ought to ſpeak with peculiar efficacy, and they ought to be carefully invited to liſten to its voice.

Such then is the manner in which we wiſh the education of young men of rank and fortune to be conducted, in order that they may be prepared for enjoying their opulence and honours with becoming dignity. Let them be early inured to habits of vigorous induſtry and perſevering firmneſs, by paſſing through a regular courſe of claſſical learning in a free ſchool; let them play and converſe with their equals, and not be permitted to form high ideas of their own importance, nor to domineer over ſervants or inferiors: Let them be carefully inſtructed in the principles of morality and religion: Let them be taught the manly exerciſes: Let them be carefully informed of the nature of the political conſtitution of their country, and of the extent of thoſe civil and political rights which it ſecures to them and their fellow-citizens: Let them be called to trace the annals of mankind through the records of hiſtory; to mark the appearances and operations of nature, and to amuſe themſelves by purſuing theſe to their general cauſes. We ſay nothing of cauſing the young man of fortune to learn ſome mechanical art: We think ſkill in a mechanical art might now and then afford him an innocent and pleaſing amuſement; but we do not conſider it as abſolutely neceſſary, and therefore do not inſiſt on his acquiring it. With thoſe accompliſhments we hope he might become an uſeful member of ſociety, might adorn the rank and fortune to which he is born, and might find wealth and high ſtation a bleſſing, not a curſe. It is peculiarly unfortunate for our age and country, that people of rank and fortune are not ſo ſtudious that their children acquire theſe as the more ſuperficial accompliſhments.

### VII. *On the Education of People deſigned for a Mercantile Employment, and for the humbler Occupations in Life not particularly connected with Literature.*

74
Elegant literature.

WERE modern literature in a leſs flouriſhing ſtate; were the Engliſh and French languages adorned with fewer eminent poetical, hiſtorical, and philoſophical compoſitions; we might perhaps inſiſt on it as neceſſary to give the boy, who is deſigned for a mercantile employment, a claſſical education. At preſent this does not appear abſolutely neceſſary; yet we do not preſume to forbid it as improper. Even the merchant will ſcarce find reaſon to repent his having been introduced to the acquaintance of Plato and Cicero. But ſtill, if the circumſtances of the parent, or any other juſt reaſon, ſhould render it inconvenient to ſend the young man who is intended for trade to a free ſchool to ſtudy the ancient languages, means may be eaſily adopted to make up for his loſs. Confine him not to writing and accounts alone. Theſe, though particularly uſeful to the merchant, have no great power to reſtrain the force of evil paſſions, or to inſpire the mind with generous and virtuous ſentiments. Though you burden him not with Latin and Greek, yet ſtrive to inſpire him with a taſte for uſeful knowledge and for elegant literature. Some of the pureſt and moſt elegant of our poets, the excellent periodical works which have appeared in our language, ſuch as the Spectator, the Adventurer, the Mirror, and the compoſitions of our Britiſh hiſtorians, together with ſome of the beſt tranſlations of the claſſics which we poſſeſs; theſe you may with great propriety put into his hands. They will teach him how to think and reaſon juſtly, and to expreſs himſelf in converſation or in writing with correctneſs and elegance: they will refine and poliſh his mind, and raiſe him above low and groſs pleaſures. And as no man, who has any occaſion to ſpeak or write, ought to be entirely ignorant of the principles of grammar, you will therefore

therefore be careful to inſtruct the young man who is deſigned for a mercantile occupation in the grammar of his mother-tongue.

75 Integrity.

A ſacred regard to his engagements, and an honeſty which may prevent him from taking undue advantages or exacting unreaſonable profits, are the virtues which a merchant is moſt frequently called to exerciſe: punctuality and integrity are the duties moſt particularly incumbent on the mercantile profeſſion. Temptations will now and then ariſe to ſeduce the merchant to the violation of theſe. But if ſuperior to every ſuch temptation, he is one of the moſt illuſtrious characters, and is likely to be one of the moſt ſucceſsful merchants. From his earlieſt years, then, labour to inſpire the child whom you intend for trade with a ſacred regard for truth and juſtice: let him be taught to view deceit and fraud, and the violation of a promiſe, with abhorrence and diſdain. Frugality is a virtue which, in the preſent age, ſeems to be antiquated or proſcribed. Even the merchant often appears better ſkilled in the arts of profuſion than in thoſe of parſimony. The miſer, a character at no time viewed as amiable, is at preſent beheld with double deteſtation and contempt. Yet, notwithſtanding theſe unfavourable circumſtances, fear not to impreſs on the young merchant habits of frugality. Let him know the folly of beginning to ſpend a fortune before he have acquired it. Let him be taught to regard a regular attention to confine his expences within due bounds, as one of the firſt virtues which can adorn his character.

76 Induſtry.

Frugality and induſtry are ſo cloſely connected, that when we recommend the one of them to the merchant, we will be naturally underſtood to recommend the other alſo. It is eaſy to ſee, that, without induſtrious application, no man can reaſonably expect to meet with ſucceſs in the occupation in which he engages: and if the merchant thinks proper to leave his buſineſs to the management of clerks and ſhop-keepers, it is not very probable that he will quickly accumulate a fortune. It is, therefore, no leſs neceſſary, that he who is intended for trade be early accuſtomed to habits of ſober application, and be carefully reſtrained from volatility and levity, than that he be inſtructed in writing, arithmetic, and keeping of accounts.

With theſe virtues and qualifications the merchant is likely to be reſpectable, and not unſucceſsful, while he continues to proſecute his trade; and if, by the bleſſing of Providence, he be at length enabled to accumulate a moderate fortune, his acquaintance with elegant literature, and the virtuous habits which he has acquired, will enable him to enjoy it with taſte and dignity. Indeed, all the advantages which a man without taſte, or knowledge, or virtue, can derive from the poſſeſſion of even the moſt ſplendid fortune, are ſo inconſiderable, that they can be no adequate reward for the toil which he undergoes, and the mean arts which he practiſes in acquiring it. At the head of a great fortune a fool can only make himſelf more ridiculous, and a man of a wicked and vicious character more generally abhorred, than if fortune had kindly concealed their crimes and follies by placing them in a more obſcure ſtation.

77 Education of perſons in the loweſt ranks.

A conſiderable part of the members of ſociety are placed in ſuch circumſtances, that it is impoſſible for them to receive the advantages of a liberal education. The mechanic and the huſbandman, who earn a ſubſiſtence by their daily labour, can ſeldom afford, whatever parental fondneſs may ſuggeſt, to favour their children with many opportunities of literary inſtruction. Content if they can provide them with food and raiment till ſuch time as they acquire ſufficient ſtrength to labour for their own ſupport, parents in thoſe humble circumſtances ſeldom think it neceſſary that they ſhould concern themſelves about giving their children learning. Happily it is not requiſite that thoſe who are deſtined to ſpend their days in this low ſphere ſhould be furniſhed with much literary or ſcientific knowledge. They may be taught to read their mother tongue, to write, and to perform ſome of the moſt common and the moſt generally uſeful operations of arithmetic: for without an acquaintance with the art of reading, it will ſcarce be poſſible for them to acquire any rational knowledge of the doctrines and precepts of religion, or of the duties of morality; the invaluable volume of the ſacred ſcriptures would be ſealed to them: we may allow them to write, in order that they may be enabled to enjoy the ſweet ſatisfaction of communicating accounts of their welfare to their abſent friends; and, beſides, both writing and arithmetic are neceſſary for the accompliſhment of thoſe little tranſactions which paſs among them. It would be hard, if even the loweſt and pooreſt were denied theſe ſimple and eaſily acquired branches of education; and happily that degree of ſkill in them which is neceſſary for the labourer and the mechanic may be atained without greater expence than may be afforded by parents in the meaneſt circumſtances. Let the youth who is born to paſs his days in this humble ſtation be carefully taught to conſider honeſt patient induſtry as one of the firſt of virtues: let him be taught to regard the ſluggard as one of the moſt contemptible of characters: teach him contentment with his lot, by letting him know that wealth and honour ſeldom confer ſuperior happineſs: Yet ſcruple not to inform him, that if he can raiſe himſelf above the humble condition to which he was born, by honeſt arts, by abilities virtuouſly exerted, he may find ſome comfort in affluent circumſtances, and may find reaſon to rejoice that he has been virtuous, induſtrious, and active. In teaching him the principles of religion, be careful to ſhow him religion as intimately connected with morality: teach him none of thoſe myſterious doctrines, whoſe ſole tendency is to foſter that enthuſiaſm which naturally prevails among the vulgar, and to perſuade them that they may be pious without being virtuous. Labour to inſpire him with an invincible abhorrence for lying, fraud, and theft. Inſpire him with an high eſteem for chaſtity, and with an awful regard to the duties of a ſon, an huſband, and a father. Thus may he become reſpectable and happy, even in his humble ſtation and indigent circumſtances; a character infinitely ſuperior, in the eyes of both God and man, to the rich and great man who miſemploys his wealth and leiſure in ſhameful and vicious purſuits.

## VIII. *On the Education of the Female Sex.*

The abſtracts which we have given of ſome of the moſt celebrated and original treatiſes on education, as well as our own obſervations on this ſubject, have been hitherto either relative to the education of both the ſexes, or directed chiefly to the education of the male ſex. But as there is a natural difference between the characters of the two ſexes, and as there are certain duties peculiar to each of them; it is eaſy to ſee that the education of the boy and that of the girl cannot, ought not, to be conducted preciſely in the ſame manner. And ſince the duties of the female ſex are ſo important to ſociety, and they form ſo conſiderable a part of our ſpecies; their education, therefore, merits the higheſt attention.

78
nilarity the cha-ſters of th ſexes the firſt riod of :.

In infancy, the inſtincts, the diſpoſitions, and the faculties of boys and girls ſeem to be nearly the ſame. They diſcover the ſame curioſity, and the ſame diſpoſition to activity. For a while they are fond of the ſame ſports and amuſements. But by and by, when we begin to make a diſtinction in their dreſs; when the girl begins to be more confined to a ſedentary life under her mother's eye, while the boys are permitted to ramble about without doors; the diſtinction between their characters begins to be formed, and their taſte and manners begin to become different. The boy now imitates the arts and the active amuſements of his father; digs and plants a little garden, builds a houſe in miniature, ſhoots his bow, or draws his little cart; while the girl, with no leſs emulation, imitates her mother, knits, ſews, and dreſſes her doll. They are no longer merely children: the one is now a girl; the other a boy. This taſte for female arts, which the girl ſo eaſily and naturally acquires, has been judiciouſly taken notice of by Rouſſeau, as affording an happy opportunity for inſtructing her in a very conſiderable part of thoſe arts which it is proper to teach her. While the girl is buſied in adorning her doll, ſhe inſenſibly becomes expert at needle-work, and learns how to adjuſt her own dreſs in a becoming manner. And therefore, if ſhe be kindly treated, it will not be a matter of difficulty to prevail with her to apply to theſe branches of female education. Her mother or governeſs, if capable of managing her with mildneſs and prudence, may teach her to read with great facility. For being already more diſpoſed to ſedentary application than the boy of the ſame age, the confinement to which ſhe muſt ſubmit in order to learn to read will be leſs irkſome to her. Some have pretended that the reaſoning powers of girls begin to exert themſelves ſooner than thoſe of boys. But, as we have already declared our opinion, that the reaſoning powers of children of both ſexes begin to diſplay themſelves at a very early period; ſo we do not believe that thoſe of the one ſex begin to appear, or attain maturity, ſooner than thoſe of the other. But the different occupations and amuſements in which we cauſe them to engage from their earlieſt years, naturally call forth their powers in different manners, and perhaps cauſe the one to imitate our modes of ſpeaking and behaviour ſooner than the other. However, as we wiſh both boys and girls to learn the art of reading at a very early age, even as ſoon as they are capable of any ſerious application; ſo we wiſh girls to be taught the art of writing, arithmetic, and the principles of religion and morals, in the ſame order in which theſe are inculcated on boys.

We need not point out the reaſons which induce us to regard theſe as accompliſhments proper for the female ſex: they ſeem to be generally conſidered as not only ſuitable, but neceſſary. It is our moſt important privilege, as beings placed in a ſituation different from that of the inferior animals, that we are capable of religious ſentiments and religious knowledge; it therefore becomes us to communicate religious inſtruction with no leſs aſſiduity and care to the youth of the female ſex than to thoſe of our own. Beſides, as the care of children during their earlier years belongs in a particular manner to the mother; ſhe, therefore, whom nature has deſtined to the important duties of a mother, ought to be carefully prepared for the proper diſcharge of thoſe duties, by being accurately inſtructed, in her youth, in ſuch things as it will be afterwards requiſite for her to teach her children.

79
Erudition, how far becoming in ladies.

Ladies have ſometimes diſtinguiſhed themſelves as prodigies of learning. Many of the moſt eminent geniuſes of the French nation have been of the female ſex. Several of our countrywomen have alſo made a reſpectable figure in the republic of letters. Yet we cannot approve of giving girls a learned education. To acquire the accompliſhments which are more proper for their ſex, will afford ſufficient employment for their earlier years. If they be inſtructed in the grammar of their mother-tongue, and taught to read and ſpeak it with propriety; be taught to write a fair hand, and to perform with readineſs the moſt uſeful operations of arithmetic: if they be inſtructed in the nature of the duties which they owe to God, to themſelves, and to ſociety; this will be almoſt all the literary inſtruction neceſſary for them. Yet we do not mean to forbid them an acquaintance with the literature of their country. The periodical writers, who have taught all the duties of morality, the decencies of life, and the principles of taſte, in ſo elegant and pleaſing a manner, may with great propriety be put into the hands of our female pupil. Neither will we deny her the hiſtorians, the moſt popular voyages and travels, and ſuch of our Britiſh poets as may be put into her hands without corrupting her heart or inflaming her paſſions. But could our opinion or advice have ſo much influence, we would endeavour to perſuade our countrymen and countrywomen to baniſh from among them the noveliſts, thoſe panders of vice, with no leſs determined ſeverity than that with which Plato excludes the poets from his republic, or that with which the converts to Chriſtianity, mentioned in the Acts, condemned their magical volumes to the flames. Unhappily, novels and plays are almoſt the only ſpecies of reading in which the young people of the preſent age take delight; and nothing has contributed more effectually to bring on that diſſoluteneſs of manners which prevails among all ranks.

80
Ornamental accompliſhments.

But we will not diſcover ſo much auſterity as to expreſs a wiſh that the education of the female ſex ſhould be confined ſolely to ſuch things as are plain and uſeful. We forbid not thoſe accompliſhments which are merely ornamental, and the deſign of which is to render them amiable in the eyes of the other ſex. When we conſider the duties for which they are deſtined by nature, we find that the art of pleaſing conſtitutes no inconſiderable part of theſe; and it would be wrong, therefore, to deny them thoſe arts, the end of which is to enable them to pleaſe. Let them endeavour to acquire taſte in dreſs: to dreſs in a neat graceful manner, to ſuit colours to her complexion, and the figure of her clothes to her ſhape, is no ſmall accompliſhment for a young woman. She who is rigged out by the taſte and dexterity of her maid and her milliner, is nothing better than a doll

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81 Dancing.

ſent abroad to public places as a ſample of their handywork Dancing is a favourite exerciſe; nay, we might almoſt call it the favourite ſtudy of the fair ſex: So many pleaſing images are aſſociated with the idea of dancing; dreſs, attendance, balls, elegance and grace of motion irreſiſtible, admiration, and courtſhip: and theſe are ſo early inculcated on the young by mothers and maids, that we need not be ſurpriſed if little Miſs conſider her leſſon of dancing as a matter of much more importance than either her book or ſampler. And indeed, though the public in general ſeem at preſent to place too high a value on dancing; and though the undue eſtimation which is paid to it ſeems owing to that taſte for diſſipation, and that rage for public amuſements, which naturally prevail amid ſuch refinement and opulence; yet ſtill dancing is an accompliſhment which both ſexes may cultivate with conſiderable advantage. It has an happy effect on the figure, the air, and the carriage; and we know not if it be not favourable even to dignity of mind: Yet, as to be even a firſt-rate poet or painter, and to value himſelf on his genius in theſe arts, would be no real ornament to the character of a great monarch; ſo any very ſuperior ſkill in dancing muſt ſerve rather to diſgrace than to adorn the lady or the gentleman. There are ſome arts in which, though a moderate degree of ſkill may be uſeful or ornamental, yet ſuperior taſte and knowledge are rather hurtful, as they have a tendency to ſeduce us from the more important duties which we owe to ourſelves and to ſociety. Of thoſe, dancing ſeems to be one: It is ſaid of a certain Roman lady, by an eloquent hiſtorian, "that ſhe was more ſkilled in dancing than became a modeſt and virtuous woman."

82 Muſic.

Muſic, alſo, is an art in which the youth of the female ſex are pretty generally inſtructed; and if their voice and ear be ſuch as to enable them to attain any excellence in vocal muſic, it may conduce greatly to increaſe their influence over our ſex, and may afford a pleaſing and elegant amuſement to their leiſure hours. The harpſichord and the ſpinnet are inſtruments often touched by female hands; nor do we preſume to forbid the ladies to exerciſe their delicate fingers in calling forth the enchanting ſounds of theſe inſtruments. But ſtill, if your daughter have no voice or ear for muſic, compel her not to apply to it.

83 Drawing.

Drawing is another accompliſhment which generally enters into the plan of female education. Girls are uſually taught to aim at ſome ſcratches with a pencil: but when they grow up, they either lay it totally aſide, or elſe apply to it with ſo much aſſiduity as to neglect their more important duties. We do not conſider ſkill in drawing, any more than ſkill in poetry, as an accompliſhment very neceſſary for the ladies; yet we agree with Rouſſeau, that as far as it can contribute to improve their taſte in dreſs, it may not be improper for them to purſue it. They may very properly be taught to ſketch and colour flowers; but we do not wiſh them to forget or lay aſide this as ſoon as the drawing-maſter is diſmiſſed: let them retain it to be uſeful through life. Though pride can never be lovely, even in the faireſt female form; yet ought the young woman to be carefully impreſſed with a due reſpect for herſelf. This will join with her native modeſty to be the guardian of her virtue, and to preſerve her from levity and impropriety of conduct.

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Such are the hints which have occurred to us on the education proper for the female ſex, as far as it ought to be conducted in a manner different from that of the male.

### IX. *Public and private Education.*

One queſtion uſually diſcuſſed by the writers on this ſubject has not hitherto engaged our attention. It is, Whether it be moſt proper to educate a young man privately, or ſend him to receive his education at a public ſchool? This queſtion has been ſo often agitated, and by people enjoying opportunities of receiving all the information which experience can furniſh on the ſubject, that we cannot be expected to advance any new argument of importance on either ſide. Yet we may ſtate what has been urged both on the one and the other.

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They who have conſidered children as receiving their education in the houſe and under the eye of their parents, and as ſecluded in a great meaſure from the ſociety of other children, have been ſometimes led to conſider this ſituation as particularly favourable for their acquiring uſeful knowledge, and being formed to virtuous habits. Though we reap many advantages from mingling in ſocial life, yet in ſociety we are alſo tainted with many vices to which he who paſſes his life in ſolitary retirement is a ſtranger. At whatever period of life we begin to mix with the world, we ſtill find that we have not yet acquired ſufficient ſtrength to reſiſt thoſe temptations to vice with which we are there aſſailed. But if we are thus ready to be infected with the contagion of vice, even at any age, no other argument can be neceſſary to ſhow the propriety of confining children from thoſe dangerous ſcenes in which this infection is ſo eaſily caught. And whoever ſurveys the ſtate of morals in a public ſchool with careful and candid attention, even though it be under the management of the moſt virtuous, judicious, and aſſiduous teachers, will find reaſon to acknowledge, that the empire of vice is eſtabliſhed there not leſs fully than in the great world. Nothing, therefore, can be more negligent or inhuman, than for parents to expoſe their children to thoſe ſeductions which a great ſchool preſents, at a time when they are ſtrongly diſpoſed to imitate any example ſet before them, and have not yet learned to diſtinguiſh between ſuch examples as are worthy of imitation, and thoſe which ought to be beheld with abhorrence. Even when under the parent's eye, from intercourſe with ſervants and viſitors their native innocence is likely to ſuffer conſiderably. Yet the parent's care will be much more likely to preſerve the manners of his child uncorrupted in his own houſe, than any aſſiduity and watchfulneſs of his teachers in a ſchool.

The morals and diſpoſitions of a child ought to be the firſt objects of our concern in conducting his education: but to initiate him in the principles of uſeful knowledge is alſo an important object; and it will be happy, if in a private education virtue be not only better ſecured, but knowledge alſo more readily acquired, than in a public. But this actually happens. When one or two boys are committed to the care of a judicious tutor, he can watch the moſt favourable ſeaſons for communicating inſtruction; he can awake curioſity and command attention by the gentle arts of inſinuation: though he ſtrive not to inflame their breaſts with emulation, which leads often to envy and inveterate hatred ; yet he will ſucceed in rendering learning pleaſing, by other means leſs likely to produce unfavourable effects on the temper and diſpoſitions of his pupils. As his attention is not divided among a number, he can pay more regard to the particular diſpoſitions and turn of mind of each of his pupils : he can encourage him who is modeſt and ſlow, and repreſs the quickneſs and volatility of the other ; and he can call forth and improve their powers, by leading them at one time to view the ſcenes of nature and the changes which ſhe ſucceſſively undergoes through the varying ſeaſons ; at another, to attend to ſome of the moſt entertaining experiments of natural philoſophy ; and again alluring them artfully to their literary exerciſes. With theſe he may mix ſome active games ; and he may aſſume ſo much of the fondneſs of the parent, as to join in them with his little pupils. Theſe are certainly circumſtances favourable both to the happineſs and to the literary improvement of youth ; but they are peculiar to a private education. Beſides, in a private education, as children ſpend more of their time with grown up people than in a public ; thoſe, therefore, who receive a domeſtic education, ſooner acquire our manner of thinking, of expreſſing ourſelves, and of behaving, in our ordinary intercourſe with one another. For the very ſame reaſon for which girls are often obſerved to be capable of prudence and propriety of behaviour at an earlier age than boys, thoſe boys who receive a family education will begin ſooner to think and act like men, than thoſe who paſs their earlier days in a public ſeminary. And though you educate your ſon at home, there is no reaſon why he ſhould be more accuſtomed to domineer over his inferiors, or to indulge a capricious or inhumane diſpoſition, than if he were brought up among fifty boys, all of the ſame age, ſize, and rank, with himſelf. He may alſo, in a private education, exerciſe his limbs with the ſame activity as in a public one. He cannot, indeed, engage in thoſe ſports for which a party of companions is neceſſary ; but ſtill there are a thouſand objects which will call forth his activity : if in the country, he will be diſpoſed to fiſh, to climb for bird-neſts, to imitate all that he ſees performed by labourers and mechanics : in ſhort, he will run, leap, throw and carry ſtones, and keenly exert himſelf in a variety of exerciſes, which will produce the moſt favourable effects on the powers both of his mind and body. It may indeed be poſſible for you to oppoſe the deſigns of nature ſo effectually, if you take pains for that purpoſe, as to repreſs the natural activity of your child or pupil, and cauſe him to pine away his time in liſtleſs indolence ; but you will thus do violence to his diſpoſitions, as well as to thoſe inſtincts which nature has for wiſe purpoſes implanted in his breaſt. And the bad conſequences which may reſult from this management are not to be conſidered as the natural effects of a domeſtic education, but as the effects of an education careleſsly or imprudently conducted.

But there is another conſideration which will perhaps be ſtill more likely than any of thoſe which we have hitherto urged, to prevail with the fond parent to give his child a private education. As the infant who is abandoned by its mother to the care of an hireling nurſe, naturally transfers its affection from the unnatural parent to the perſon who ſupplies her room and performs the duties incumbent upon her ; ſo the boy who is baniſhed from his parent's houſe at a time when he has ſcarce begun to know the relation in which he ſtands to his father and mother, brothers or ſiſters, ſoon ceaſes to regard them with that fondneſs which he had contracted for them from living in their company and receiving their good offices. His reſpect, his affection, and his kindneſs, are beſtowed on new objects, perhaps on his maſter or his companions ; or elſe his heart becomes ſelfiſh and deſtitute of every tender and generous feeling ; and when the gentle and amiable affections of filial and fraternal love are thus, as it were, torn up by the roots, every evil paſſion ſprings up, with a rapid growth, to ſupply their place. The boy returns afterwards to his father's houſe : but he returns as a ſtranger ; he is no longer capable of regarding his parents and relations with the ſame tenderneſs of affection. He is now a ſtranger to that filial love which ſprings up in the breaſt of the child who is conſtantly ſenſible of the tender care of his parents, and ſpends his earlier years under their roof, in ſuch a manner as to appear the effect of inſtinct rather than of habit. Selfiſh views are now the only bond which attaches him to his parents and relations ; and by coming under their influence at ſo early a period of life, he is rendered for ever incapable of all the moſt amiable virtues which can adorn human nature. Let the parent, therefore, who loves his child, and wiſhes to obtain from him a mutual return of affection, beware of excluding him from his houſe, and devolving the ſole charge of him upon another, in his childhood.

Theſe views repreſent a private education as the moſt favourable to virtue, to knowledge, and to the mutual affection which ought always to unite the parent and his child. But let us now liſten to the arguments which are uſually urged in behalf of a public education.

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Arguments for public education.

In the firſt place, it has been aſſerted, that a public education is much more favourable than a private to the pupil's improvement in knowledge, and much more likely to inſpire him with an ardour for learning. In a private education, with whatever aſſiduity and tenderneſs you labour to render learning agreeable to your pupil, ſtill it will be but an irkſome taſk. You may confine him to his books but for a very ſhort ſpace in the courſe of the day, and allow him an alternation of ſtudy and recreation. Still, however, you will never be able to render his books the favourite objects of his attention. He will apply to them with reluctance and careleſs indifference : even while he ſeems engaged on his leſſon, his mind will be otherwiſe occupied ; it will wander to the ſcenes where he purſues his diverſions, and to thoſe objects which have attracted his deſires. If the period during which you require his application be extremely ſhort ; during the firſt part of it, he will ſtill be thinking of the amuſements from which you have called him, and regretting his confinement ; during the laſt, he will fondly anticipate the moment when he is to be ſet at liberty, and think of new amuſements. Again, if you confine him during a longer period, ſtill more unfavourable effects will follow. Peeviſhneſs, dulneſs, and a determined averſion to all that bears the name of literature, will

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be naturally impreſſed on his mind by ſuch treatment. How can it be otherwiſe? Books poſſeſs ſo few of thoſe qualities which recommend any object to the attention of children, that they cannot be naturally agreeable. They have nothing to attract and detain the eye, the ear, or any of the ſenſes; they preſent things with which children are unacquainted, and of which they know not the value: children cannot look beyond the letters and words, to the things which theſe repreſent; and even though they could, yet is it much more pleaſing to view ſcenes and objects as they exiſt originally in nature, than to trace their images in a faint and imperfect repreſentation. It is vain, therefore, to hope that children will be prevailed with to pay attention to books by means of any allurements which books can of themſelves preſent. Other means muſt be uſed; but thoſe in a private education you cannot command. In a public ſeminary, the ſituation of maſters with reſpect to their pupils is widely different. When a number of boys meet together in the ſame ſchool, each of them ſoon begins to feel the impulſe of a principle which enables the maſter to command their attention without difficulty, and prompts them to apply with cheerful ardour to taſks which would otherwiſe be extremely irkſome. This principle is a generous emulation, which animates the breaſt with the deſire of ſuperior excellence, without inſpiring envy or hatred of a competitor. When children are prudently managed in a great ſchool, it is impoſſible for them not to feel its impulſe. It renders their taſks ſcarce leſs agreeable than their amuſements, and directs their activity and curioſity to proper objects. View the ſcholar at a public ſchool, compoſing his theme, or turning over his dictionary; how alert! how cheerful! how indefatigable! He applies with all the eagerneſs, and all the perſeverance, of a candidate for one of the moſt honourable places in the temple of fame. Again, behold and pity that poor youth who is confined to his chamber with no companion but his tutor; none whoſe ſuperiority can provoke his emulation, or whoſe inferiority might flatter him with thoughts of his own excellence, and thus move him to preſerve by induſtrious application the advantages which he has already gained. His book is before him; but how languid, how liſtleſs his poſture! how heavy and dull his eye! Nothing is expreſſed in his countenance but dejection or indignation. Examine him concerning his leſſon; he replies with confuſion and heſitation. After a few minutes obſervation, you cannot fail to be convinced that he has ſpent his time without making any progreſs in learning; that his ſpirits are now broken, his natural cheerfulneſs deſtroyed, and his breaſt armed with invincible prejudices againſt all application in the purſuit of literary knowledge. Beſides, in a ſchool there is ſomething more than emulation to render learning leſs diſagreeable than it naturally is to children. The ſlighteſt obſervation of life, or attention to our own conduct in various circumſtances, will be ſufficient to convince us, that whenever mankind are placed in circumſtances of diſtreſs, or ſubjected to any diſagreeable reſtraint, that which a ſingle perſon bears with impatience or dejection will make a much leſs impreſſion on his mind if a number of companions be joined with him in his ſuffering or reſtraint. It is eſteemed a piece of much greater ſeverity to confine a priſoner in a ſolitary cell, than when he is permitted to mix with others in the ſame uncomfortable ſituation. A journey appears much leſs tedious to a party of travellers, than to him who beats the path alone. In the ſame manner, when a number of boys in a great ſchool are all buſied on the ſame or on ſimilar taſks, a ſpirit of induſtry and perſeverance is communicated from one to another over the whole circle; each of them inſenſibly acquires new ardour and vigour; even though he feel not the ſpur of emulation, yet, while all are buſy around him, he cannot remain idle. Theſe are facts obvious to the moſt careleſs obſerver.

Neither are public ſchools ſo unfavourable to the virtue of their members as they have been repreſented to be. If the maſters are men of virtue and prudence, careful to ſet a good example before their pupils, attentive to the particular character and behaviour of each individual among them, firm to puniſh obſtinate and incorrigible depravity, and even to expel thoſe who are more likely to injure the morals of others than to be reclaimed themſelves, and at the ſame time eager to applaud and to encourage amiable and virtuous diſpoſitions wherever they appear; under the government of ſuch maſters, a public ſchool will not fail to be a ſchool of virtue. There will no doubt be particular individuals among the pupils of ſuch a ſeminary, whoſe morals may be corrupt and their diſpoſitions vicious; but this, in all probability, will ariſe from the manner in which they were managed before entering the ſchool, or from ſome other circumſtances, rather than from their being ſent for their education to a public ſchool. Again, at a public ſchool young people enjoy much greater advantages for preparing them to enter the world, than they can poſſibly be favoured with if brought up in a private and ſolitary manner. A great ſchool is a miniature repreſentation of the world at large. The objects which engage the attention of boys at a ſchool are different from thoſe which occupy their parents; the views of the boys are leſs extenſive, and they are not yet capable of proſecuting them by ſo many baſe and mean arts: but, in other reſpects, the two ſcenes and the actors upon them nearly reſemble each other; on both you behold contending paſſions, oppoſite intereſts, weakneſs, cunning, folly, and vice. He therefore who has performed his part on the miniature ſcene, has rehearſed as it were for the greater; if he has acquitted himſelf well on the one, he may be alſo expected to diſtinguiſh himſelf on the other; and even he who has not diſtinguiſhed himſelf at ſchool, at leaſt enters the world with ſuperior advantages when viewed in compariſon with him who has ſpent his earlier days in the ignorance and ſolitude of a private and domeſtic education. Beſides, when a number of boys meet at a public ſeminary of education, ſeparated from their parents and relations; nearly of the ſame age, engaged in the ſame ſtudies, and fond of the ſame amuſements; they naturally contract friendſhips with one another which are more cordial and ſincere than any that take place between perſons farther advanced in life. A friendſhip is often formed between two boys at ſchool which continues through life, and is productive of the happieſt conſequences to each of them. While at ſchool, they mutually aſſiſt and encourage each other in their learning; and their mutual affection renders their taſks leſs burdenſome

denſome than they might otherwiſe find them. As they advance in life, their friendſhip ſtill continues to produce happy effects on their ſentiments and conduct: perhaps they are mutually uſeful to each other by intereſt or by perſonal aſſiſtance in making their way in the world; or when they are engaged in the cares and buſtle of life, their intercourſe and correſpondence with each other may contribute much to conſole them amid the vexations and fatigues to which they may be expoſed.

Such are the chief arguments uſually adduced in favour of a public education. When we compare them with thoſe which have been urged to recommend a private education, we will perhaps find that each has its peculiar advantages. A public education is the more favourable to the acquiſition of knowledge, to vigour of mind, and to the formation of habits of induſtry and fortitude. A private education, when judiciouſly conducted, will not fail to be peculiarly favourable to innocence and to mildneſs of diſpoſition; and notwithſtanding what has ſometimes been advanced by the advocates for a public education, it is ſurely better to keep youth at a diſtance from the ſeductions of vice till they be ſufficiently armed againſt them, than to expoſe them to them at an age when they know not to what dangers they lead, and are wholly unable to reſiſt them. Were we to give implicit credit to the ſpecious talk of the two parties, either a private or a public education would form characters more like to angels than to thoſe men whom we ordinarily meet in the world: but they ſpeak with the ardour of enthuſiaſts; and therefore we muſt liſten with caution both to the facts which they adduce, and to the inferences which they draw. Could we, without expoſing children to the contagion of a great town, procure for them the advantages of both a public and a private education at the ſame time, we would by this means probably ſucceed beſt in rendering them both reſpectable ſcholars and good men. If we may preſume to give our opinion freely, we would adviſe parents never, except when ſome unavoidable neceſſity of circumſtances obliges them, to expel their children from under their own roof till they be advanced beyond their boyiſh years: let the mother nurſe her own child; let her and the father join in ſuperintending its education: they may then expect to be rewarded, if they have acted their parts aright, by commanding the gratitude, the affection, and the reſpect of their child, while he and they continue to live together. Let matters be ſo ordered, that the boy may reſide in his father's houſe, and at the ſame time attend a public ſchool: but let the girl be educated wholly under her mother's eye.

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## X. *On Travel.*

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ANOTHER queſtion which has been often diſcuſſed comes here under our review. The philoſophers of ancient Greece travelled in ſearch of knowledge. Books were then ſcarce, and thoſe few which were to be obtained were no very rich treaſuries of uſeful information. The rhapſodies of a poet, the rude legends of ſome ill-informed and fabulous hiſtorian, or the theories of fanciful philoſophers, were all that they could afford. Thales, Lycurgus, Solon, Plato, travelled, ſeeking that knowledge among more civilized nations which they could not find in their native country. In the courſe of their travels, they heard the lectures of celebrated philoſophers; conſulted the prieſts, who were the guardians of the traditions of antiquity, concerning the nature and origin of thoſe traditions; and obſerved the inſtitutions of thoſe nations which were moſt renowned for the wiſdom of their legiſlature. When they ſet out to viſit foreign countries, they ſeem to have propoſed to themſelves a certain end; and by keeping that end ſteadily in view during the courſe of their travels, they gained ſuch improvement as to be able on their return to command the veneration of their countrymen by means of the knowledge which they were enabled to communicate. Many beſides the philoſophers of ancient Greece have travelled for improvement, and have ſucceeded in their views. But ancient hiſtory does not relate to us, that travelling was conſidered by the Greeks or Romans as neceſſary to finiſh the education of their young men of fortune before they entered the ſcenes of active life. It is true, after Greece became a province of the Roman empire, and the Romans began to admire the ſcience and elegance of Greece, and to cultivate Grecian literature, the young noblemen of Rome often repaired to Rhodes and Athens to complete their ſtudies under the maſters of philoſophy and eloquence who taught in thoſe cities. But they went thither with the ſame views with which our youth in modern times are ſent to free ſchools and univerſities, not to acquire knowledge by the obſervation of nature, of the inſtitutions, manners, and cuſtoms of nations; but merely to hear lectures, read books, and perform exerciſes. In modern times, a few men of reflection and experience have now and then travelled for improvement: but the greateſt part of our travellers, for a long time, were enthuſiaſtic devotees who went in pilgrimage to viſit the ſhrine or relics of ſome favourite ſaint; ſoldiers, who wandered over the earth to deſtroy its inhabitants; or merchants, whoſe buſineſs as factors between widely diſtant countries and nations led them to brave every danger in traverſing from one corner of the globe to another. But ſince the nations of modern Europe have begun to emerge from rudeneſs, ignorance, and ſervile depreſſion, they have formed one great commonwealth, the members of which are ſcarce leſs intimately connected with each other than were the ſtates of ancient Greece. The conſequence of this mutual connection and dependence is, that almoſt all the nations of Europe have frequent intercourſe with one another; and as ſome of them are and have long been more enlightened and refined than others, thoſe nations who have attained the higheſt degrees of civilization and refinement have naturally attracted the admiration and homage of the reſt. Their language has been ſtudied, their manners and arts have been adopted, and even their dreſs has been imitated. Other nations have thronged to pay the homage due to their ſuperior merit, and to ſtudy under them as maſters. Hence has ariſen the practice which at preſent prevails among us of ſending our youth to complete their education by travelling, before we introduce them to active life, or require them to engage in buſineſs. Formerly young men were not ſent to travel till after they had proceeded through the forms of a regular education, and had at leaſt attained ſuch an age that they were no longer to be conſidered as mere boys. But the progreſs of luxury, the deſire of parents to introduce their children into the world at an early age that they may early attain to wealth and honours, and various other cauſes, have gradually introduced the practice of ſending mere boys to foreign countries, under pretence of affording them opportunities of ſhaking off prejudices, of ſtoring their minds with truly uſeful knowledge, and of acquiring thoſe graceful manners and that manly addreſs which will enable them to acquit themſelves in a becoming manner when they are called to the duties of active life. How much travelling at ſuch an early age contributes to fulfil the views of parents, a ſlight ſurvey of the ſenate-houſe, the gambling-houſes, the race courſe, and the cockpit, will readily convince the ſagacious obſerver.

But we wiſh to foſter no prejudices againſt neighbouring nations; we entertain no ſuch prejudices in favour of Britain, as to wiſh to confine our countrymen within the ſea-girt iſle. Let us inquire, what advantages may be gained by travelling, and at what age it may be moſt proper to ſet out in purſuit of thoſe advantages.

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Travel neceſſary to the acquiſition of knowledge.

After all that bookiſh men have urged, and notwithſtanding all that they may continue vehemently to urge, in behalf of the knowledge to be derived from their beloved books; it muſt ſtill be acknowledged, that books can teach us little more than merely the language of men. Or, if we ſhould grant that books are of higher importance, and that language is the leaſt valuable part of the knowledge which they teach, yet ſtill we need to beware that they lead us not aſtray; it is better to examine nature with the naked eye, than to view her through the ſpectacles of books. Neither the theories or experiments of philoſophers, nor the narratives of travellers, nor the relations of hiſtorians, though ſupported by a numerous train of authorities, are worthy of implicit credit. You retire from the world, confine yourſelf for years to your cloſet, and read volume after volume, hiſtorians, philoſophers, and poets; at laſt you fancy that you have gained an immenſe ſtore of knowledge: But leave your retirement, return into the world, compare the knowledge which you have treaſured up with the appearances of nature; you will find that you have laboured in vain, that it is only the ſemblance of knowledge which you have acquired, and will not ſerve for a faithful guide in life, nor even enable you to diſtinguiſh yourſelf for literary merit. Compare the relations of travellers with one another; how ſeldom do they agree when they deſcribe the ſame ſcenes and the ſame people! Turn your attention to the moſt reſpectable hiſtorians, compare their accounts of the ſame events; what diſagreement! what contrariety! Where ſhall truth be found? Liſten to the cool, the candid philoſophers; what contradictory theories do they build on the ſame ſyſtem of facts!

We agree, then, that it is better to ſeek knowledge by actual obſervation and experiment, than to receive it at ſecond-hand from the information of others. He who would gain an acquaintance with the beauties of external nature, muſt view them with his own eyes; he who would know the operations of the human underſtanding, muſt reflect upon what paſſes in his own mind; he who would know the cuſtoms, opinions, and manners of any people, muſt mingle with them, muſt obſerve their conduct, and liſten to their converſation. The arts are acquired by actual practice; the ſciences by actual obſervation in your own perſon, and by deducing inferences from your obſervations.

If therefore to extend our knowledge can contribute in any degree to render us happier, wiſer, or better; travelling, as being more favourable to knowledge than the ſtudy of books, muſt be highly advantageous. Get well acquainted with your own country; with the manners, the cuſtoms, the laws, and the political ſituation of your countrymen: Get alſo a knowledge of books; for books would not be altogether uſeleſs, though they could ſerve no other purpoſe but to teach us the language in which mankind expreſs themſelves: And then, if your judgment have attained maturity; if curioſity prompt you; if your conſtitution be robuſt and vigorous, and your ſpirits lively; you may imitate the Solons, Homers, and Platos of old, and viſit foreign countries in ſearch of knowledge, and with a view to bring home ſomething which may be of real utility to yourſelf and your country. You will, by this time, be ſo much maſter of the language of your own country, that you will not loſe it while you are learning the languages of foreign nations; your principles of taſte and of right and wrong will be ſo formed and fixed, that you will not deſpiſe any inſtitution or cuſtom or opinion merely becauſe it prevails not in your own country; nor yet will you be ready to admire and adopt any thing, merely becauſe it prevails among a foreign nation who are diſtinguiſhed for profound and extenſive knowledge, or for elegance of taſte and manners. No; you will diveſt yourſelf of every prejudice, and judge only by the fixed unalterable principles which determine the diſtinction between right and wrong, between truth and falſehood, between beauty and deformity, ſublimity and meanneſs. Your object will not be to learn exotic vices, to mingle in frivolous amuſements, or to form a catalogue of inns. Your views, your inquiries, will have a very different direction. You will attend to the ſtate of the arts, of the ſciences, of morals, manners, and government; you will alſo contemplate with eager delight, the grand or beautiful ſcenes of nature, and examine the vegetable productions of the various regions through which you paſs, as well as the different tribes of animals which inhabit them; you will obſerve what bleſſings the beneficence of nature has conferred on the inhabitants of each particular diviſion of the globe, and how far the ingenuity and induſtry of man have taken advantage of the kindneſs of nature. Thus ſurveying the face of the earth, and conſidering how advantages and diſadvantages are balanced with each other through every various region and climate from one extremity of the globe to another; you will admire and revere that impartiality with which the Author of nature has diſtributed his benefits to the whole human race. When from the chilly climes and ſtubborn ſoil of the north, you turn your eyes to the fertile, genial regions of the ſouth, where every tree is loaded with exquiſite fruits, and every vegetable is nouriſhing and delicious; you will be pleaſed to find, that the inhabitants of the north, by their ſuperior ingenuity and vigour, are able to raiſe themſelves to circumſtances no leſs comfortable and reſpectable than thoſe which the nations inhabiting between the tropics enjoy: when you behold the French ſhaking off the yoke of deſpotiſm, and aſpiring to the ſweets of liberty as well as their Britiſh neighbours; you will be pleaſed to ſee, that the natural gaiety and cheerfulneſs of the former nation render them not incapable of the energy of the latter. You will be pleaſed to view the remains of antiquity, and the noble monuments of art; but you will think it below you to trifle away your time in gazing at palaces and churches, and collecting ruſty medals and fragments of marble; you will ſeek the ſociety of eminent men, and eagerly cultivate an acquaintance with the moſt diſtinguiſhed artiſts and men of ſcience who adorn the nations among whom you may happen to ſojourn: Knowing that the knowledge which is to be acquired in great towns, is by no means an adequate compenſation for the vicious habits which you are liable to contract in them; and beſides, that the luxuries, the arts, the manners, the virtues, and the vices of all great towns are nearly the ſame, ſo that when you have ſeen one, you have ſeen all others; you will avoid taking up your reſidence for any conſiderable time in any of the great towns through which you have occaſion to paſs in the courſe of your travels. The traveller who has attained the previous accompliſhments which we have mentioned as neceſſary, who ſets out with the views which we have ſuppoſed him to entertain, and who conducts his travels in this manner, cannot fail to return home enriched with much uſeful knowledge; he cannot but derive more real improvement from travelling, than he could have gained by ſpending the ſame period of time in ſolitary ſtudy: when he returns to his native country, he will appear among his countrymen as more than a philoſopher; a ſage, and a benefactor. His knowledge is ſo extenſive and accurate, his views are ſo liberal and enlarged, and he is ſo ſuperior to prejudices, without being the enemy of any uſeful eſtabliſhments, that he will be enabled to command univerſal eſteem, by performing his part in life with becoming dignity and propriety, and perhaps to render his name illuſtrious, and his memory dear to future times, by ſome important ſervices to the community to which he belongs, or even to mankind in general.

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But though we have thus far, and we hope for obvious and ſolid reaſons, decided in favour of travelling, as being more likely than a ſolitary application to books, to furniſh the mind with uſeful and ornamental knowledge; yet we do not ſee that our Britiſh youth either take care to furniſh themſelves with the previous knowledge which we conſider as indiſpenſably neceſſary in order to prepare them for travelling with advantage, or ſet out with proper views, or proſecute their travels in a prudent judicious manner. After receiving a very imperfect education, in which religious and moral inſtruction are almoſt wholly neglected, and no means are uſed to inſpire the youthful mind with ſolid, virtuous, manly qualities; but every art is tried to make the young man appear learned, while his mind is deſtitute of all uſeful information, and to teach him to aſſume the confidence of manhood before he has attained even to a moderate degree of ſenſe and prudence;—after an education conducted in this manner, and with theſe views, the ſtripling is ſent abroad to view the world, and is expected to return home a finiſhed character, an ornament and a comfort to his parents and all his connexions. He is hitherto unacquainted, perhaps, even with the ſimple events of the hiſtory of his native country; and either totally ignorant of claſſical literature, or but very ſuperficially inſtructed in it. He has not yet viewed with a diſcerning eye the manners and cuſtoms prevailing among his countrymen; he knows not the nature of the government under which he lives, nor the ſpirit of thoſe laws by which his civil conduct muſt be regulated. He has no fixed principles; no clear, diſtinct views. But to ſupply all his wants of this nature, he is put into the hands of a travelling governor, who is to be entirely ſubmiſſive to his will, and yet to ſerve him both for eyes and intellect. This governor is generally either ſome macaroni officer, who is conſidered as well bred, and thought to know the world; or elſe, perhaps, ſome cringing ſon of literature, who having ſpent much time among his books, without acquiring ſuch ſtrength or dignity of mind as to raiſe him above frivolity of manners and converſation or pitiful fawning arts, is therefore regarded as happily qualified for this important charge. This reſpectable perſonage and his pupil are ſhipped off for France, that land of elegant diſſipation, frivolity, and faſhion. They travel on with eager impatience, till they reach the capital. There the young man is induſtriouſly introduced to all the gay ſcenes which Paris can diſplay. He is, at firſt, confounded; by and by his ſenſes are faſcinated; new deſires are awaked in his breaſt; all around him he ſees the ſons of diſſipation wallowing in debauchery, or the children of vanity fluttering about like ſo many gawdy inſects. The poor youth has no fixed principles: he has not been taught to regard vanity as ridiculous, or to turn from vice with abhorrence. No attempt is made to allure him to thoſe objects, an attention to which can alone render travelling truly beneficial. Hitherto his mind had been left almoſt wholly uncultivated; and now the ſeeds of vice are plentifully ſown in it. From one great town he is conveyed to another, till he viſit almoſt every place in Europe where profligacy of manners has attained to any uncommon height. In this happy courſe of education he probably continues to purſue improvement till he is well acquainted with moſt of the poſt roads, the principal inns, and the great towns at leaſt in France and Italy; and perhaps till he has worn out his conſtitution, and rendered his mind totally incapable of any generous ſentiments or ſober reflection. He then reviſits his native country, to the inexpreſſible happineſs of his parents, who now eagerly long to embrace their all-accompliſhed child. But how miſerably are the poor folks diſappointed, when they find his conſtitution waſted, his underſtanding uninformed, his heart deſtitute of every manly or generous ſentiment; and perceive him to poſſeſs no accompliſhment, but ſuch as are merely ſuperficial? Perhaps, however, his parents are prevented by their partiality both for their child and for the means which they have adopted in conducting his education, from viewing his character and qualifications in a true light. Perhaps they overlook all his defects, or conſider them as ornaments, and regard their dear ſon as the mirror of perfection. But, unfortunately, though they be blind to the hideous deformity of the monſter which they have formed, they cannot hinder it from being conſpicuous to others; though they may view their ſon's character as amiable and reſpectable, they cannot render it uſeful, they cannot prevent it from being hurtful to ſociety. Let this youth whoſe education has been thus wiſely conducted, let him be placed at the head of an opulent fortune, advanced to a ſeat in the legiſlative body of his country, or called to act in any public character; how will he diſtinguiſh himſelf? As the virtuous patriot, the honeſt yet able ſtateſman, the ſkilful general, or the learned upright judge? How will he enjoy his fortune? Will he be the friend of the poor, the ſteady ſupporter of the laws and conſtitution under whoſe protection he lives? Will he ſhow himſelf capable of enjoying *otium cum dignitate?* If we reaſon by the uſual laws of probability, we cannot expect that he ſhould: and if we obſerve the manners and principles of our men of wealth and high birth who have been brought up in this manner, we find our reaſonings confirmed.

Such are the opinions which candid obſervation leads us to entertain with regard to the advantages which may be gained by travelling.

He whoſe mind has been judiciouſly cultivated, and who has attained to maturity of judgment, if he ſet out on his travels with a view to obtain real improvements, and perſiſt invariably in the proſecution of that view, cannot but derive very great advantages from travelling.

But again, thoſe young men whoſe minds have not been previouſly cultivated by a judicious education, who ſet out without a view to the acquiſition of real knowledge, and who wander among foreign nations, without attention to any thing but their luxuries, their follies, and their vices, thoſe poor young men cannot gain any real improvement from their travels.

Our countrymen, who travel for improvement, do not appear to derive ſo much advantage from their travels as were to be wiſhed, becauſe they generally receive too ſuperficial an education, ſet out at too early a period of life, and direct not their views to objects of real utility and importance.

## XI. *On Knowledge of the World, and Entrance into Life.*

90 Unhappy effects of a too early introduction into the world.

MUCH has been ſaid concerning the utility of a knowledge of the world, and the advantage of acquiring it at an early period of life. But thoſe who have the moſt earneſtly recommended this knowledge of the world, have generally explained themſelves in ſo inaccurate a manner concerning it, that it is difficult to underſtand what ideas they affix to it. They ſeem to wiſh, that, in order to acquire it, young people may be early made acquainted with all the vices and follies of the world, introduced into polite company, carried to public places, and not confined even from the gaming table and the ſtews. Some knowledge of the world may, no doubt, be gained by theſe means. But it is ſurely dearly purchaſed; nor are the advantages which can be derived from it ſo conſiderable, as to tempt the judicious and affectionate parent to expoſe his child to the infection of vanity, folly, and vice, for their ſake. Carry a boy or girl into public life at the age of fourteen or fifteen; ſhow them all the ſcenes of ſplendid vanity and diſſipation which adorn London or Paris; tell them of the importance of dreſs, and of the ceremonies of good breeding and the forms of intercourſe; teach them that faſhionable indifference and aſſurance which give the *ton* to the manners of our fine gentlemen and fine ladies of the preſent age. What effects can you expect the ſcenes into which you introduce them, and the myſteries which you now teach them, to produce on the minds of the children? They have a direct tendency to inſpire them with a taſte for vanity, frivolity, and diſſipation. If you wiſh them to be like the fooliſh, the diſſipated, and the gay, you are likely to obtain your purpoſe; but if, on the contrary, your views are to prepare them for diſcharging the duties of life, you could not adopt more improper means: for though they be well acquainted with all thoſe things on which you place ſo much value, yet they have not thereby gained any acceſſion of uſeful knowledge. They are not now more able than before to eſtimate the real value of objects; nay, their judgement is now more liable than before to be miſled in eſtimating the value of the objects around them. Luxury, vanity, and faſhion, have ſtamped on many things an ideal value. By mingling at an early age in thoſe ſcenes of the world where luxury, vanity, and faſhion, reign with arbitrary ſway, young people are naturally impreſſed with all thoſe prejudices which theſe have a tendency to inſpire. Inſtead of acquiring an uſeful knowledge of the world, they are rendered incapable of ever viewing the world with an unprejudiced and diſcerning eye. If poſſible, therefore, we ſhould rather labour to confine young people from mingling in the ſcenes of gay and diſſipated life till after they have attained maturity of age and judgment. They will then view them in a proper light, and perhaps be happy enough to eſcape the infectious contagion of vice.

91 What knowle of the world m be ſafel commu cated to young ple.

But there is another and a more valuable knowledge of the world, which we ought induſtriouſly to communicate to them as ſoon as they are capable of receiving it. As ſoon as they are made thoroughly acquainted with the diſtinctions between right and wrong, between virtue and vice, between piety and impiety, and have become capable of entering into our reaſonings; we ought then to inform them concerning the various eſtabliſhments and inſtitutions which exiſt in ſociety; concerning the cuſtoms, opinions, and manners of mankind; and concerning the various degrees of ſtrength or weakneſs of mind, of ingenuity or dullneſs, of virtuous or vicious qualities, which diſcriminate thoſe characters which appear in ſociety. We ought alſo to ſeize every opportunity which may be preſented of exemplifying our leſſons by inſtances in real life. We muſt point out to them thoſe circumſtances which have led mankind to place an undue value on ſome objects, while they appretiate others much below their real utility and importance. Thus let us fortify their judgements againſt that impreſſion which the dazzling novelty of the ſcene, and the force of paſſion, will be apt to produce; and communicate to them a knowledge of the world, without expoſing them imprudently to the contagion of its vices and follies.

When at length the period arrives at which they muſt be emancipated from ſubjection, and committed to the guidance of their own conſcience and reaſon, and of thoſe principles which we have laboured to inculcate on their minds; let us warn them of the dangers to which they are about to be expoſed; tell them of the glory and the happineſs to which they may attain; inſpire them, if poſſible, with diſdain for folly, vanity, and vice, whatever dazzling or enchanting forms they may aſſume; and then diſmiſs them to enrich their minds with new ſtores of knowledge by viſiting foreign nations; or, if that ſhould be inconvenient, to enter immediately on the duties of ſome uſeful employment in active life.

EDULCORATION, properly ſignifies the rendering ſubſtances more mild. Chemical edulcoration conſiſts almoſt always in taking away acids and other ſaline ſubſtances; and this is effected by waſhing the bodies to which they adhere in a large quantity of water. The waſhing of diaphoretic antimony, powder of algaroth, &c. till the water comes off quite pure and inſipid, are inſtances of chemical edulcoration.—In pharmacy, juleps, potions, and other medicines, are ſaid to be *edulcorated*, by adding ſugar of ſyrup.

EDWARD, the name of ſeveral kings of England. See (*Hiſtory of*) ENGLAND.

EDWARDS, (George), fellow of the royal and antiquarian ſocieties, was born at Stratford, a hamlet belonging to Weſtham in Eſſex, on the 3d of April 1694. After having ſpent ſome time at ſchool, he was put apprentice to a tradeſman in Fenchurch ſtreet. His maſter, who was eminent both for his piety and ſkill in the languages, treated him with great kindneſs; but about the middle of his apprenticeſhip, an accident happened which totally put a ſtop to the hopes of young Edwards's advancing himſelf in the way of trade. Dr Nicolas, a perſon of eminence in the phyſical world, and a relation of his maſter's, happened to die. The Doctor's books were removed to an apartment occupied by Edwards, who eagerly employed all his leiſure hours, both in the day and great part of the night, in peruſing thoſe which treated of natural hiſtory, ſculpture, painting, aſtronomy, and antiquities. The reading of theſe books entirely deprived him of any inclination for mercantile buſineſs he might have formerly had, and he reſolved to travel into foreign countries. In 1716, he viſited moſt of the principal towns in Holland, and in about a month returned to England. Two years after, he took a voyage to Norway, at the invitation of a gentleman who was diſpoſed to be his friend, and who was nephew to the maſter of the ſhip in which he embarked. At this time Charles XII. was beſieging Frederickſhall; by which means our young naturaliſt was hindered from making ſuch excurſions into the country as otherwiſe he would have done, for the Swedes were very careful to confine ſuch ſtrangers as could not give a good account of themſelves. But notwithſtanding all his precaution, he was confined by the Daniſh guard, who ſuppoſed him to be a ſpy employed by the enemy to get intelligence of their deſigns. However, by obtaining teſtimonials of his innocence, a releaſe was granted. In 1718 he returned to England, and next year viſited Paris by the way of Dieppe. During his ſtay in this country he made two journeys of 100 miles each; the firſt to Chalons in Champagne, in May 1720; the ſecond on foot, to Orleans and Blois; but an edict happening at that time to be iſſued for ſecuring vagrants, in order to tranſport them to America, as the banks of the Miſſiſſippi wanted population; our author narrowly eſcaped a weſtern voyage. On his arrival in England, Mr Edwards cloſely purſued his favourite ſtudy of natural hiſtory, applying himſelf to drawing and colouring ſuch animals as fell under his notice. A ſtrict attention to natural, more than pictureſque beauty, claimed his earlieſt care: birds firſt engaged his particular attention; and having purchaſed ſome of the beſt pictures of theſe ſubjects, he was induced to make a few drawings of his own; which were admired by the curious, who encouraged our young naturaliſt to proceed, by paying a good price for his early labours. Among his firſt patrons and benefactors may be mentioned James Theobalds, Eſq; of Lambeth; a gentleman zealous for the promotion of ſcience. Our artiſt, thus unexpectedly encouraged, increaſed in ſkill and aſſiduity; and procured, by his application to his favourite purſuit, a decent ſubſiſtence and a large acquaintance. However, he remitted his induſtry in 1731; when, in company with two of his relations, he made an excurſion to Holland and Brabant, where he collected ſeveral ſcarce books and prints, and had an opportunity of examining the original pictures of ſeveral great maſters at Antwerp, Bruſſels, Utrecht, and other cities. In December 1733, by the recommendation of the great Sir Hans Sloane, Bart. preſident of the College of Phyſicians, he was choſen librarian, and had apartments in the college. This office was peculiarly agreeable to his taſte and inclination, as he had the opportunity of a conſtant recourſe to a valuable library, filled with ſcarce and curious books on the ſubject of natural hiſtory, which he ſo aſſiduouſly ſtudied. By degrees he became one of the moſt eminent ornithologiſts in this or any other country. His merit is ſo well known in this reſpect, as to render any eulogium on his performances unneceſſary: but it may be obſerved, that he never truſted to others what he could perform himſelf; and often found it ſo difficult to give ſatisfaction to his own mind, that he frequently made three or four drawings to delineate the object in its moſt lively character, attitude, and repreſentation. In 1743, the firſt volume of the Hiſtory of Birds was publiſhed in quarto. His ſubſcribers exceeding even his moſt ſanguine expectations, a ſecond volume appeared in 1747. The third volume was publiſhed in 1750. In 1751, the fourth volume came from the preſs. This volume being the laſt he intended to publiſh at that time, he ſeems to have conſidered it as the moſt perfect of his productions in natural hiſtory; and therefore devoutly offered it up to the great God of nature, in humble gratitude for all the good things he had received from him in this world. Our author, in 1758, continued his labours under a new title, viz. *Gleanings of Natural Hiſtory*. A ſecond volume of the Gleanings was publiſhed in 1760. The third part, which made the ſeventh and laſt volume of his works, appeared in 1764. Thus our author, after a long ſeries of years, the moſt ſtudious application, and the moſt extenſive correſpondence to every quarter of the world, concluded a work which contains engravings and deſcriptions of more than 600 ſubjects in natural hiſtory, not before deſcribed or delineated. He likewiſe added a general index in French and Engliſh; which was afterwards perfected, with the Linnæan names, by that great naturaliſt Linnæus himſelf, who frequently honoured him with his friendſhip and correſpondence. Some time after Mr Edwards had been appointed library keeper to the Royal College of Phyſicians, he was, on St Andrew's day, in the year 1750, preſented with an honorary compliment by the preſident and council of the Royal Society, with the gold medal, the donation of Sir Godfrey Copley, Bart. annually given on that day to the author of any new diſcovery in art or nature, in conſideration of his natural hiſtory juſt then completed. A copy of this medal he had afterwards engraved, and placed under the title in the firſt volume of his hiſtory. He was a few years afterwards elected fellow of the Royal Society, and of the Society of Antiquaries, London; and alſo a member of many of the academies of ſciences and learning in different parts of Europe. In compliment to theſe honorary diſtinctions from ſuch learned bodies, he preſented elegant coloured copies of all his works to the Royal College of Phyſicians, the Royal Society, the Society of Antiquarians, and to the Britiſh muſeum: alſo to the Royal Academy of Sciences at Paris, from whom he received the moſt polite and obliging letter of thanks by their then ſecretary Monſieur Deſouchy. His collection of drawings, which amounted to upwards of 900, were purchaſed by the earl of Bute. They contain a great number of Britiſh as well as foreign birds, and other animals hitherto not accurately delineated or deſcribed. After the publication of the laſt work, being arrived at his 70th year, he found his ſight begin to fail, and his hand loſt its wonted ſteadineſs. He retired from public employment to a little houſe which he purchaſed at Plaiſtow; previous to which, he diſpoſed of all the copies, as well as plates, of his works. The converſation of a few ſelect friends, and the peruſal of a few ſelect books, were the amuſement of the evening of his life; and now and then he made an excurſion to ſome of the principal cities in England, particularly to Briſtol, Bath, Exeter, and Norwich. Some years before his death, the alarming depredations of a cancer, which baffled all the efforts of phyſical ſkill, deprived him of the ſight of one of his eyes: he alſo ſuffered much from the ſtone, a complaint to which at different periods of his life he had been ſubject. Yet it has been remarked, that in the ſevereſt paroxyſms of miſery, he was ſcarcely known to utter a ſingle complaint. Having completed his 80th year, emaciated with age and ſickneſs, he died on the 23d of July 1773, deſervedly lamented by a numerous acquaintance.

EDYSTONE LIGHT-HOUSE, lying off Plymouth harbour, was firſt erected by the corporation of the Trinity-houſe in 1696; in conſideration of which, the maſters, &c. of Engliſh ſhipping agreed to pay one penny a ton outwards and inwards. It was demoliſhed by the ſtorm of 1703, and re-erected by act of parliament in the 4th of Queen Anne, and the ſame duty on tonage of ſhips granted for its ſupport; which law was enforced in the 8th of June. It has been ſince deſtroyed and rebuilt.

EECKHOUT (Gerbrant Vander), hiſtory and portrait painter, was born at Amſterdam in 1621, and was a diſciple of Rembrandt; whoſe manner of deſigning, colouring, and penciling, he imitated ſo nearly, that it is difficult to diſtinguiſh between ſeveral of his paintings and thoſe of his maſter. He painted after nature, and with ſuch a force as only nature can equal: his touch and the colouring are the ſame as Rembrandt's; but he rather excelled him in the extremities of his figures. His principal employment was for portraits; and in thoſe he was admirable: but he ſurpaſſed all his contemporaries in the power he had of painting the mind in the countenance. But although Eeckhout painted portraits to ſuch a degree of perfection, yet was he much more pleaſed to paint hiſtorical ſubjects, and he executed them with equal ſucceſs. In that ſtyle his compoſition is rich and full of judgment; the diſtribution of his maſſes of light and ſhadow is truly excellent; and in the opinion of many connoiſſeurs he had more tranſparence in his colouring, and better expreſſion, than his maſter. He died in 1674.

EEL, in ichthyology, a ſpecies of Muræna.

*Eel Fiſhing.* See Bobbing and Sniggling.

The ſilver eel may be catched with ſeveral ſorts of baits, as powdered beef, garden worms, minnows, hens guts, fiſh garbage, &c. The moſt proper time for taking them is in the night, faſtening your line to the bank ſides, with your laying hook in the water: or a line may be thrown with good ſtore of hooks, baited and plumbed, with a float to diſcover where the line lies, that they may be taken up in the morning.

*Microſcopic Eels.* See Animalcule, N° 8.

*Eels in vinegar*, are ſimilar to thoſe in ſour paſte. The taſte of vinegar was formerly thought to be occaſioned by the biting of theſe little animals, but that opinion has been long exploded. Mentzelius ſays, he has obſerved the actual transformation of theſe little creatures into flies: but as this hath never been obſerved by any other perſon, nor is there an inſtance of ſuch a transformation in any other animalcule, it ſeems probable that Mentzelius hath been miſtaken in his obſervations.

*Eel Spear*, a forked inſtrument with three or four jagged teeth, uſed for catching the eels: that with the four teeth is beſt, which they ſtrike into the mud at the bottom of the river, and if it ſtrike againſt any eels it never fails to bring them up.

EFFARE', or Effraye', in heraldry, a term applied to a beaſt rearing on its hind legs, as if it were frighted or provoked.

EFFECT, in a general ſenſe, is that which reſults from, or is produced by, any cauſe. See Cause.

EFFEMINATE, womaniſh, unmanly, voluptuous.

Effeminate *(effeminati)*, according to the vulgate, are mentioned in ſeveral places of ſcripture. The word is there uſed to ſignify ſuch as were conſecrated to ſome profane god, and proſtituted themſelves in honour of him. The Hebrew word *kadeſh*, tranſlated *effeminatus*, properly ſignifies *conſecrated*, and hence was attributed to thoſe of either ſex, who publicly proſtituted themſelves in honour of Baal and Aſtarte. Moſes expreſsly forbids theſe irregularities among the Iſraelites; but the hiſtory of the Jews ſhows, that they were notwithſtanding frequently practiſed. Levit. xxiii. 18.

EFFENDI, in the Turkiſh language, ſignifies *maſter*: and accordingly is a title very extenſively applied; as to the mufti and emirs, to the prieſts of moſques, to men of learning, and of the law. The grand chancellor of the empire is called *reis-effendi*.

EFFERVESCENCE, an inteſtine motion excited betwixt the parts of two bodies of different natures, when

when they reciprocally diſſolve each other. Efferveſcences are commonly attended with bubbles, vapours, ſmall jets of the liquid, and a hiſſing noiſe; and theſe phenomena are occaſioned by the air which at that time diſengages itſelf. Sometimes alſo they are accompanied with a great degree of heat, the cauſe of which is not ſo well known.

Formerly the word *fermentation* was alſo applied to efferveſcences; but now that word is confined to the motion naturally excited in animal and vegetable matters, and from which new combinations among their principles take place.

EFFIGY, the portrait, figure, or exact repreſentation of a perſon.

EFFIGY, is alſo uſed for the print or impreſſion of a coin, repreſenting the prince's head who ſtruck it.

*EFFIGY, to execute or degrade in*, denotes the execution or degradation of a condemned contumacious criminal, who cannot be apprehended or ſeized. In France, they hang a picture on a gallows or gibbet, wherein is repreſented the criminal, with the quality or manner of the puniſhment: at the bottom is written the ſentence of condemnation. Such perſons as are ſentenced to death are executed in effigy.

EFFLORESCENCE, among phyſicians, the ſame with exanthema. See EXANTHEMA.

EFFLORESCENCE, in chemiſtry, denotes the formation of a kind of mealy powder on the ſurface of certain bodies. Effloreſcence is occaſioned either by decompoſition or drying. The effloreſcence which happens to cobalt and martial pyrites is of the firſt; and that obſerved on the cryſtals of marine alkali, Glauber's ſalt, &c. of the latter kind. An effloreſcence is ſometimes alſo a ſpecies of cryſtallization, the nature of which is not well underſtood; as, the beautiful vegetations which ſhoot up from vitriolated tartar acidulated either with the vitriolic or nitrous acids, the ſaline ſpiculæ which are obſerved to ſhoot from ſalt butter, &c.

Beſides the common cryſtallization of ſalts, all of them have the property of appearing in the form of an effloreſcence, or ſmall ſaline ſpiculæ, when mixed with any thick ſubſtance, particularly lime. Whatever ſalt happens to be made uſe of, there is little or no difference in the effloreſcence. Thus, in butter very much ſalted, the ſea ſalt ſhoots in the form of long ſpiculæ, though the ſea ſalt itſelf never ſhoots but in the form of cubical cryſtals. In like manner, Glauber's ſalt will appear in the form of an effloreſcence, as well as the foſſil alkali, &c. nor will the form of the cryſtals of the effloreſcence be perceptibly different from thoſe of ſea ſalt. The effloreſcences which we ſee very commonly upon walls are in general Glauber's ſalt. In ſome caſes (but ſeldom in ſuch effloreſcences as we have examined) they are compoſed of foſſil alkali. The reaſon of theſe differences is not known. In almoſt all caſes of this kind there ſeems to be a real growth of ſalt. On one ſpot of a plaſter wall about two feet ſquare, which we obſerved particularly, this growth was very evident. The produce was a true Glauber's ſalt; and by frequently taking off the effloreſcence, eight ounces were procured; nor did the prolific virtue of the wall ſeem to be in the leaſt impaired by the waſte.

EFFLORESCENTIA, in botany, (from *effloreſco* to bloom); the preciſe time of the year and month in which every plant ſhows its firſt flowers.

Some plants flower twice a-year, as is common between the tropics; others oftener, as the monthly roſe. The former are called by botaniſts *biferæ*; the latter, *multiferæ*.

The time of flowering is determined by the degree of heat which each ſpecies requires. Mezereon and ſnowdrop produce their flowers in February; primroſe, in the beginning of March; the greater number of plants, during the month of May; corn, and other grain, in the beginning of June; the vine, in the middle of the ſame month; ſeveral compound flowers, in the months of July and Auguſt; laſtly, meadow-ſaffron flowers in the month of October, and announces the ſpeedy approach of winter.

Graſs of Parnaſſus always flowers about the time of cutting down the hay; and in Sweden, the different ſpecies of thiſtle, mountain lettuce, ſuccory, and balſam, ſeldom flower till after the ſummer ſolſtice: the country men even know, as by a kalendar, that the ſolſtice is paſt when theſe plants begin to produce their flowers.

The temperature of the ſeaſons has a mighty influence both in accelerating and retarding the flowering of plants. All plants are earlier in warm countries: hence ſuch as are cultivated out of their native ſoil, never flower till the heat of the climate, or ſituation into which they are removed, is equal to that under the influence of which they produced flowers in their own country. For this reaſon, all exotics from warm climates are later in this country than many plants which it naturally produces.

In general, we may obſerve, that the plants of the coldeſt countries, and thoſe produced on the mountains in all climates, being of equal temperature, flower about the ſame time, *viz.* during our ſpring in Europe.

Plants that grow betwixt the tropics, and thoſe of temperate climates, flower during our ſummer.

Plants of temperate climates, ſituated under the ſame parallel of latitude with certain parts of Europe, but removed much farther to the weſt, ſuch as Canada, Virginia, and Miſſiſſippi, do not produce flowers till autumn.

Plants of temperate climates in the oppoſite hemiſphere to Europe, flower during our winter, which is the ſummer of theſe regions.

Linnæus and Adanſon have given a ſketch of the different times in which plants flower at Upſal and Paris.

EFFLUVIUM, in phyſiology, a term much uſed by philoſophers and phyſicians, to expreſs the minute particles which exhale from moſt, if not all, terreſtrial bodies, in form of ſenſible vapours.

EFFRONTES, in church hiſtory, a ſect of heretics, in 1534, who ſcraped their forehead with a knife till it bled, and then poured oil into the wound. This ceremony ſerved them inſtead of baptiſm. They are likewiſe ſaid to have denied the divinity of the Holy Spirit.

EFFUSION, the pouring out of any liquid thing with ſome degree of force. In the ancient heathen ſacrifices there were divers effuſions of wine and other liquors, called *libations*.

Effusion, or Fusion, in aſtronomy, denotes that part of the ſign Aquarius, repreſented on celeſtial globes and planiſpheres, by the water iſſuing out of the urn of the water-bearer.

EFT, in zoology, the Engliſh name of the common lizard. See Lacerta.

EGERIA, or Ægeria, a nymph held in great veneration by the Romans. She was courted by Numa Pompilius; and, according to Ovid, ſhe became his wife. This prince frequently viſited her; and that he might introduce his laws and new regulations into the ſtate, he ſolemnly declared before the Roman people, that they were previouſly ſanctified and approved by the nymph Egeria. Ovid ſays, that Egeria was ſo diſconſolate at the death of Numa, that ſhe melted into tears, and was changed into a fountain by Diana. She is reckoned by many as a goddeſs who preſided over the pregnancy of women; and ſome maintain that ſhe is the ſame as Lucina.

EGG, in phyſiology a body formed in certain females, in which is contained an embryo or fœtus of the ſame ſpecies, under a cortical ſurface or ſhell. The exterior part of an egg is the ſhell; which in a hen, for inſtance, is a white, thin, and friable cortex, including all the other parts. The ſhell becomes more brittle by being expoſed to a dry heat. It is lined everywhere with a very thin but a pretty tough membrane, which dividing at, or very near, the obtuſe end of the egg, forms a ſmall bag, where only air is contained. In new laid eggs this follicle appears very little, but becomes larger when the egg is kept.

Within this are contained the albumen or white, and the vitellus or yolk; each of which have their different virtues.

The albumen is a cold, viſcous, white liquor in the egg, different in conſiſtence in its different parts. It is obſerved, that there are two diſtinct albumens, each of which is encloſed in its proper membrane. Of theſe one is very thin and liquid: the other is more denſe and viſcous, and of a ſomewhat whiter colour; but, in old and ſtale eggs, after ſome days incubation, inclining to a yellow. As this ſecond albumen covers the yolk on all ſides, ſo it is itſelf ſurrounded by the other external liquid. The albumen of a fecundated egg is as ſweet and free from corruption, during all the time of incubation, as it is in new laid eggs; as is alſo the vitellus. As the eggs of hens conſiſt of two liquors ſeparated one from another, and diſtinguiſhed by two branches of umbilical veins, one of which goes to the vitellus, and the other to the albumen; ſo it is very probable that they are of different natures, and conſequently appointed for different purpoſes.

When the vitellus grows warm with incubation, it becomes more humid, and like melting wax or fat; whence it takes up more ſpace. For as the fœtus increaſes, the albumen inſenſibly waſtes away and condenſes: the vitellus, on the contrary, ſeems to loſe little or nothing of its bulk when the fœtus is perfected, and only appears more liquid and humid when the abdomen of the fœtus begins to be formed.

The chick in the egg is firſt nouriſhed by the albumen; and when this is conſumed, by the vitellus, as with milk. If we compare the chalazæ to the extremities of an axis paſſing through the vitellus, which is of a ſpherical form, this ſphere will be compoſed of two unequal portions, its axis not paſſing through its centre; conſequently, ſince it is heavier than the white, its ſmaller portion muſt always be uppermoſt in all poſitions of the egg.

The yellowiſh white round ſpot, called *cicatricula*, is placed on the middle of the ſmaller portion of the yolk; and therefore, from what has been ſaid in the laſt paragraph, muſt always appear on the ſuperior part of the vitellus.

Not long before the excluſion of the chick, the whole yolk is taken into its abdomen; and the ſhell, at the obtuſe end of the egg, frequently appears cracked ſome time before the excluſion of the chick. The chick is ſometimes obſerved to perforate the ſhell with its beak. After excluſion, the yolk is gradually waſted, being conveyed into the ſmall guts by a ſmall duct.

Eggs differ very much according to the birds that lay them, as to their colour, form, bigneſs, age, and the different way of dreſſing them: thoſe moſt uſed in food are hens eggs; of which, ſuch as are new laid are beſt.

As to the preſervation of eggs, it is obſerved that the egg is always quite full when it is firſt laid by the hen; but from that time it gradually becomes leſs and leſs ſo, to its decay: and however compact and cloſe its ſhell may appear, it is nevertheleſs perforated with a multitude of ſmall holes, though too minute for the diſcernment of our eyes, the effect of which is a daily decreaſe of matter within the egg, from the time of its being laid; and the perſpiration is much quicker in hot weather than in cold.

To preſerve the egg freſh, there needs no more than to preſerve it full, and ſtop its tranſpiration; the method of doing which is, by ſtopping up thoſe pores with matter which is not ſoluble in watery fluids: and on this principle it is, that all kinds of varniſh, prepared with ſpirit of wine, will preſerve eggs freſh for a long time, if they are carefully rubbed all over the ſhell: tallow, or mutton fat, is alſo good for this purpoſe; for ſuch as are rubbed over with this, will keep as long as thoſe coated over with varniſh.

*Artificial Method of Hatching Eggs*. See Hatching.

EGINA. See Ægina.

EGINHART, ſecretary to the emperor Charles the Great, was a German. He is the moſt ancient hiſtorian of that nation, and wrote very eloquently for a man of the 9th century. It is ſaid, that he inſinuated himſelf ſo well into the favour of Imma, daughter to Charles the Great, that he obtained from her whatever he deſired. Charles the Great, having found out the intrigue, did not do as Auguſtus, who is thought to have baniſhed Ovid becauſe he believed him to be too much favoured by Julia; for he married the two lovers together, and gave them a fine eſtate in land.

EGLANTINE, in botany. See Rosa.

EGLON, a king of the Moabites, who oppreſſed the Iſraelites for 18 years (Judges iii. 12—14.). Calmet confounds this ſervitude of the Hebrews with that under Chuſan-riſhathaim, making it to ſubſiſt only eight years, from the year of the world 2591 to 2599; whereas

whereas this ſervitude under Eglon laſted 18 years, and commenced in the year of the world 2661, and 62 years after they had been delivered by Othniel from the ſubjection of Chuſan-riſhathaim.

EGRA, a town of Bohemia, formerly imperial, but now ſubject to the houſe of Auſtria. It contains a great number of able artificers, and is famous for its mineral waters. Wallenſtein, the emperor's general, was aſſaſſinated here in 1634. The French became maſters of this town in 1741; but afterwards being blocked up, they were forced to capitulate on September 7th, 1743. It is looked upon as a town of the greateſt conſequence in Bohemia, except Prague. It is ſeated on a river of the ſame name, in E. Long. 12. 30. N. Lat. 50. 21.

EGRET, in ornithology, a ſpecies of ardea. See Ardea.

EGYPT, an extenſive country of Africa, lying between 30° and 36° of eaſt longitude, and between 21° and 31° of north latitude. It is bounded by the Mediterranean on the north; by the Red ſea and iſthmus of Suez, which divide it from Arabia, on the eaſt; by Abyſſinia or Ethiopia, on the ſouth; and by the deſerts of Barca and Nubia, on the weſt; being 600 miles in length from north to ſouth, and from 100 to 200 in breadth from eaſt to weſt.

1 ferent nes.

As a nation, the Egyptians may with juſtice lay claim to as high antiquity as any in the world. The country was moſt probably peopled by Mizraim the ſon of Ham and grandſon of Noah.—By its ancient inhabitants it was called *Chemia*, and is ſtill called *Chemi* in the language of the *Copts* or native Egyptians; and this name it is ſuppoſed to have received from Ham the ſon of Noah. In ſcripture, we find it moſt generally named *Mizraim;* though in the Pſalms it is ſtyled the *land of Ham.*—To us it is beſt known by the name *Egypt,* the etymology of which is more uncertain.—Some derive it from *Ægyptus,* a ſuppoſed king of the country: others ſay it ſignifies no more than "the land of the *Copts;*" *Aia* in Greek ſignifying a country, and *Æcoptos* being eaſily ſoftened into *Ægyptus.*—The moſt probable opinion, however, ſeems to be, that it received its name from the blackneſs of its ſoil, and the dark colour both of its river and inhabitants: for ſuch a blackiſh colour is by the Greeks called *ægyptios* from *gyps, and ægyps* "a vulture;" and by the Latins, *ſubvulturius.* For the ſame reaſon, other names of a ſimilar import have been given to this country by the Greeks; ſuch as *Aeria,* and *Melambolus:* the river itſelf was called *Melo* or *Melas;* by the Hebrews, *Shihor;* and by the Ethiopians, *Siris;* all of which ſignify "black."

Ancient Egypt is by ſome divided into two parts, the Upper and Lower Egypt: by others into three, the Upper Egypt, properly ſo called, or *Thebais;* the Middle Egypt, or *Heptanomes;* and the Lower Egypt, the beſt part of which was the *Delta,* or that ſpace encompaſſed by the branches of the Nile. See Thebais, &c.

The Egyptians, like the Chineſe, pretend to an exceſſive antiquity, pretending to have records for ten, twenty, or even fifty thouſand years. Thus their hiſtory is ſo much involved in obſcurity and fable, that for many ages it muſt be paſſed over in ſilence.—The firſt mortal king whom the Egyptians own to have reigned in that country, was *Menes* or *Menas.* At what time he reigned, it would be to very little purpoſe to inquire. He had been preceded, however, by a ſet of immortals, who it ſeems left him the kingdom in a very bad ſituation: for the whole country, except Thebais, was a moraſs; the people alſo were entirely deſtitute of religion, and every kind of knowledge which could render their life comfortable and happy. Menes diverted the courſe of the Nile, which before that time had waſhed the foot of a ſandy mountain near the borders of Libya, built the city of Memphis, inſtructed his ſubjects, and did other things of a ſimilar kind which are uſually attributed to the founders of kingdoms.

2 Invaded by the ſhepherds.

From the time of Menes, the Egyptian chronology is filled with a liſt of 330 kings, who reigned 1400 years, but did nothing worthy of notice.—The firſt diſtinct piece of hiſtory we find concerning Egypt, is the irruption of the *Shepherds,* by whom the country was ſubdued; but whether this revolution happened during the vaſt interval of indolence above mentioned, or before or after, cannot be known. The affair is thus related by Manetho. It happened, in the reign of Timaus king of Egypt, that God being diſpleaſed with the Egyptians, they ſuffered a great revolution: for a multidude of men, ignoble in their race, took courage, and, pouring from the eaſt into Egypt, made war with the inhabitants; who ſubmitted to them without reſiſtance. The ſhepherds, however, behaved with the greateſt cruelty; burnt the cities, threw down the temples of the gods; and put to death the inhabitants, carrying the women and children into captivity. This people came from Arabia, and were called *Hycſos,* or *king-ſhepherds.* They held Egypt in ſubjection for 259 years; at the end of which period, they were obliged by a king of Upper Egypt, named *Amoſis,* or *Thethmoſis,* to leave the country. This prince's father had, it ſeems, gained great advantages over them, and ſhut them up in a place called *Abaris,* or *Avaris,* containing 10,000 acres of land. Here they were cloſely beſieged by Amoſis, with an army of 400,000 men; but at laſt the king, finding himſelf unable to reduce them by force, propoſed an agreement, which was readily accepted. In conſequence of this agreement, the ſhepherds withdrew from Egypt with their families, to the number of 240,000; and, taking the way of the deſert, entered Syria: but fearing the Aſſyrians, who were then very powerful, and maſters of Aſia, they entered the land of Judæa; and built there a city capable of holding ſo great a multitude, and called it *Jeruſalem.*

According to Mr Bruce, the ſhepherds who invaded Egypt were no other than the inhabitants of Barabra. They were, he ſays, *carriers* to the Cuſhites who lived farther to the ſouth. The latter had built the many ſtately temples in Thebes and other cities of Egypt; though, according to him, they had no dwelling places but holes or caves in the rocks. Being a commercial people, they remained at home collecting and preparing their articles, which were diſperſed by the *barabers* or ſhepherds already mentioned. Theſe, from the nature of their employment, lived in moveable habitations, as the Tartars do at this day. By the Hebrews, he tells us, they were called *phut,* but *ſhepherds* by every other people; and from the name *baraber,* the word *Barabra* is derived. By their employment, which was the diſperſing the Arabian and African goods all over the continent, they had become a great and powerful people; and from their oppoſite diſpoſitions and manners, became very frequently enemies to the Egyptians. To one Salatis our author aſcribes the deſtruction of Thebes in Upper Egypt, ſo much celebrated by Homer for its magnificence. But this certainly cannot be the caſe; for Homer wrote long after the time of Joſeph: and we find that even then the Egyptians had the ſhepherds in abhorrence, in all probability becauſe they had been grievouſly oppreſſed by them. Mr Bruce counts three invaſions of theſe people; the firſt, that of Salatis already mentioned, who overthrew the firſt dynaſty of Egyptian kings from Menes, and deſtroyed Thebes: the ſecond was that of Sabacco or *So*; for according to him this was not the name of a ſingle prince, but of a people, and ſignifies *ſhepherds*: and the third, after the building of Memphis, where 240,000 of them were beſieged as above mentioned. But accounts of this kind are evidently inconſiſtent in the higheſt degree; for how is it poſſible that the *third* invaſion, antecedent to the building of Jeruſalem, could be poſterior to the *ſecond*, if the latter happened only in the days of Hezekiah?

In theſe early ages, however, it would ſeem that the kingdom of Egypt had been very powerful and its dominion very widely extended; ſince we find it ſaid, that the *Bactrians* revolted from Oſymandyas, another Egyptian king of very high antiquity, and of whoſe wealth the moſt marvellous accounts are given.

After an unknown interval of time from this monarch, reigned Seſoſtris. He was the firſt great warrior whoſe conqueſts are recorded with any degree of diſtinctneſs. In what age of the world he lived, is uncertain. Some chronologers, among whom is Sir Iſaac Newton, are of opinion, that he is the Seſac or Shiſhak, who took Jeruſalem in the reign of Rehoboam the ſon of Solomon. Others, however, place him much earlier; and Mr Whiſton will have him to be the Pharaoh who refuſed to part with the Iſraelites, and was at laſt drowned in the Red ſea. Mr Bryant endeavours to prove that no ſuch perſon ever exiſted; but that in his hiſtory, as well as that of many ancient heroes, we have an abridgment of that of the Cuſhites or Babylonians, who ſpread themſelves over gerat part of the then known world, and everywhere brought the people in ſubjection to them. His reign is reckoned the moſt extraordinary part of the Egyptian hiſtory; and the following ſeems to be the leaſt fabulous account that can be got of it. The father of Seſoſtris was told in a dream, by the god Vulcan, that his ſon, who was then newly born, or perhaps ſtill unborn, ſhould be lord of the whole earth. His father, upon the credit of this viſion, got together all the males in the land of Egypt that were born on the ſame day with Seſoſtris; appointed nurſes and proper perſons to take care of them, and had them treated like his own child; being perſuaded that they who had been the conſtant companions of his youth would prove the moſt faithful miniſters and ſoldiers. As they grew up, they were inured to laborious exerciſes; and, in particular, were never permitted to taſte any food till they had performed a courſe of 180 furlongs, upwards of 22 of our miles. When the old king imagined they were ſufficiently educated in the martial way he deſigned them to follow, they were ſent by way of trial of their abilities againſt the Arabians. In this expedition Seſoſtris proved ſucceſsful, and in the end ſubdued that people who had never before been conquered. He was ſent to the weſtward, and conquered the greateſt part of Africa; nor could he be ſtopped in his career till he arrived at the Atlantic ocean. Whilſt he was on this expedition, his father died; and then Seſoſtris reſolved to fulfil the prediction of Vulcan, by actually conquering the whole world. As he knew that this muſt take up a long time, he prepared for his journey in the beſt manner poſſible. The kingdom he divided into 36 provinces, and endeavoured to ſecure the affections of the people by gifts both of money and land. He forgave all who had been guilty of offences, and diſcharged the debts of all his ſoldiers. He then conſtituted his brother Arais the ſupreme regent; but forbade him to uſe the diadem, and commanded him to offer no injury to the queen or her children, and to abſtain from the royal concubines. His army conſiſted of 600,000 foot, 24,000 horſe, and 27,000 chariots. Beſides theſe land forces, he had at ſea two mighty fleets; one, according to Diodorus, of 400 ſail. Of theſe fleets, one was deſigned to make conqueſts in the weſt, and the other in the eaſt; and therefore the one was built on the Mediterranean and the other on the Red ſea. The firſt of theſe conquered Cyprus, the coaſt of Phœnicia, and ſeveral of the iſlands called *Cyclades*; the other conquered all the coaſts of the Red ſea; but its progreſs was ſtopped by ſhoals and difficult places which the navigators could not paſs, ſo that he ſeems not to have made many conqueſts by ſea.

With the land forces Seſoſtris marched againſt the Ethiopians and Troglodites; whom he overcame, and obliged them to pay him a tribute of gold, ebony, and ivory. From thence he proceeded as far as the promontory of Dira, which lay near the ſtraits of Babelmandel, where he ſet up a pillar with an inſcription in ſacred characters. He then marched on to the country where cinnamon grows, or at leaſt to ſome country where cinnamon at that time was brought, probably ſome place in India; and here he in like manner ſet up pillars, which were to be ſeen for many ages after. As to his farther conqueſts, it is agreed by almoſt all authors of antiquity, that he overran and pillaged the whole continent of Aſia, and ſome part of Europe. He croſſed the Ganges, and erected pillars on its banks; and from thence he is ſaid to have marched eaſtward to the very extremity of the Aſiatic continent. Returning from thence, he invaded the Scythians and Thracians; but all authors do not agree that he conquered them. Some even affirm, that he was overthrown by them with great ſlaughter, and obliged to abandon a great part of his booty and military ſtores. But whether he had good or bad ſucceſs in theſe parts, it is a common opinion that he ſettled a colony in Colchis. Herodotus, however, who gives the moſt particular account of the conqueſts of this monarch, does not ſay whether the colony was deſignedly planted by Seſoſtris; or whether part of his army loitered behind the reſt, and took up their reſidence in that region. From his own knowledge, he aſſerts, that the inhabitants of that country were undoubtedly of Egyptian deſcent. This was evident from the perſonal reſemblance they bore to the Egyptians,

tians, who were ſwarthy complexioned and frizzle haired; but more eſpecially from the conformity of their cuſtoms, particularly circumciſion.

The utmoſt boundary of this mighty monarch's conqueſts, however, was in the country of Thrace; for beyond this country his pillars were nowhere to be ſeen. Theſe pillars he was accuſtomed to ſet up in every country which he conquered, with the following inſcription, or one to the ſame purpoſe: "Seſoſtris, king of kings, and lord of lords, ſubdued this country by the power of his arms." Beſides theſe, he left alſo ſtatues of himſelf; two of which, according to Herodotus, were to be ſeen in his time; the one on the road between Epheſus and Phocæa, and the other between Smyrna and Sardis: they were armed after the Ethiopian and Egyptian manner, holding a javelin in one hand and a bow in the other. Acroſs the breaſt they had a line drawn from one ſhoulder to the other, with the following inſcription: "This region I obtained by theſe my ſhoulders." They were miſtaken for images of Memnon.

3
urns to
pt.

The reaſons given by Seſoſtris for his returning into Egypt from Thrace, and thus leaving the conqueſt of the world unfiniſhed, were the want of proviſions for his army, and the difficulty of the paſſes. Moſt probably, however, his return was haſtened by the intelligence he received from the high prieſt of Egypt, concerning the rebellious proceedings of his brother; who, encouraged by his long abſence, had aſſumed the diadem, violated the queen, and alſo the royal concubines. On receiving this news, Seſoſtris haſtened from Thrace; and at the end of nine years came to Peluſium in Egypt, attended by an innumerable multitude of captives taken from many different nations, and loaded with the ſpoils of Aſia. The treacherous brother met him at this city; and it is ſaid, with very little probability, that Seſoſtris accepted of an invitation to an entertainment from him. At this he drank freely, together with the queen and the reſt of the royal family. During the continuance of the entertainment, Armais cauſed a great quantity of dried reeds to be laid round the apartment where they were to ſleep; and as ſoon as they were retired to reſt ſet fire to the reeds. Seſoſtris perceiving the danger he was in, and that his guards, overcharged with liquor, were incapable of aſſiſting him, ruſhed through the flames, and was followed by his wife and children. In thankſgiving for this wonderful deliverance, he made ſeveral donations to the gods, particularly to Vulcan the god of fire. He then took vengeance on his brother Armais, ſaid to be the Danaus of the Greeks, who, being on this occaſion driven out of Egypt, withdrew into Greece.

4
great
ks.

Seſoſtris now laid aſide all thoughts of war, and applied himſelf wholly to ſuch works as might tend to the public good, and his own future reputation. In order to prevent the incurſions of the Syrians and Arabians, he fortified the eaſt ſide of Egypt with a wall which ran from Peluſium through the deſert to Heliopolis, for 187½ miles. He raiſed alſo an incredible number of vaſt and lofty mounts of earth, to which he removed ſuch towns as had before been ſituated too low, in order to ſecure them from the inundations of the Nile. All the way from Memphis to the ſea he dug canals which branched out from the Nile; and not only made an eaſier communication between different places, but rendered the country in a great meaſure impaſſable to an enemy. He erected a temple in every city in Egypt, and dedicated it to the ſupreme deity of the place; but in the courſe of ſuch a great undertaking as this neceſſarily muſt have been, he took care not to employ any of his Egyptian ſubjects. Thus he ſecured their affection, and employed the vaſt multitude of captives he had brought along with him; and to perpetuate the memory of a tranſaction ſo remarkable, he cauſed to be inſcribed on all theſe temples, "No one native laboured hereon." In the city of Memphis, before the temple of Vulcan, he raiſed ſix gigantic ſtatues, each of one ſtone. Two of them were 30 cubits high, repreſenting himſelf and his wife; the other four were 20 cubits each, and repreſented his four ſons. Theſe he dedicated to Vulcan in memory of his above mentioned deliverance. He raiſed alſo two obeliſks of marble 120 cubits high, and charged them with inſcriptions, denoting the greatneſs of his power, his revenues, &c.

The captives taken by Seſoſtris are ſaid to have been treated with the greateſt barbarity; ſo that at laſt they reſolved at all events to deliver themſelves from a ſervitude ſo intolerable. The Babylonians particularly were concerned in this revolt, and laid waſte the country to ſome extent; but being offered a pardon and a place to dwell in, they were pacified, and built for themſelves a city, which they called *Babylon*. Towards the conquered princes who waited on him with their tribute the Egyptian monarch behaved with unparalleled inſolence. On certain occaſions he is ſaid to have unharnaſſed his horſes, and, yoking kings together, made them draw his chariot. One day, however, obſerving one of the kings who drew his chariot to look back upon the wheels with great earneſtneſs, he aſked what made him look ſo attentively at them? The unhappy prince replied, "O king, the going round of the wheel puts me in mind of the viciſſitudes of fortune: for as every part of the wheel is uppermoſt and lowermoſt by turns, ſo it is with men; who one day ſit on a throne, and on the next are reduced to the vileſt degree of ſlavery." This anſwer brought the inſulting conqueror to his ſenſes; ſo that he gave over the practice, and thenceforth treated his captives with great humanity. At length this mighty monarch loſt his ſight, and laid violent hands on himſelf.

5
His death.

After the death of Seſoſtris, we meet with another chaſm of an indeterminate length in the Egyptian hiſtory. It concludes with the reign of Amaſis or Ammoſis; who being a tyrant, his ſubjects joined Actiſanes the king of Ethiopia to drive him out.—Thus Actiſanes became maſter of the kingdom; and after his death follows another chaſm in the hiſtory, during which the empire is ſaid to have been in a ſtate of anarchy for five generations.—This period brings us down to the times of the Trojan war. The reigning prince in Egypt was at that time called *Cetes;* by the Greeks, *Proteus*. The prieſts reported that he was a magician; and that he could aſſume any ſhape he pleaſed, even that of fire. This fable, as told by the Greeks, drew its origin from a cuſtom among the Egyptians, perhaps introduced by Proteus. They were uſed to adorn and diſtinguiſh the heads of their kings with the repreſentations of animals or vegetables, or

6
Origin of
the fable of
Proteus.

7 Arrival of Paris and Helen in Egypt.

8 Egypt conquered by Sabbaco.

even with burning incenſe, in order to ſtrike the beholders with the greater awe. Whilſt Proteus reigned, Paris or Alexander, the ſon of Priam king of Troy, was driven by a ſtorm on the coaſt of Egypt, with Helen, whom he was carrying off from her huſband. But when the Egyptian monarch heard of the breach of hoſpitality committed by Paris, he ſeized him, his miſtreſs, and companions, with all the riches he had brought away with him from Greece. He detained Helen, with all the effects belonging to Menelaus her huſband, promiſing to reſtore them to the injured party whenever they were demanded; but commanded Paris and his companions to depart out of his dominions in three days, on pain of being treated as enemies. In what manner Paris afterwards prevailed upon Proteus to reſtore his miſtreſs, we are not told; neither do we know any thing further of the tranſactions of this prince's reign nor of his ſucceſſors, except what has entirely the air of fable, till the days of Sabbaco the Ethiopian, who again conquered this kingdom. He began his reign with an act of great cruelty, cauſing the conquered prince to be burnt alive: nevertheleſs, he no ſooner ſaw himſelf firmly eſtabliſhed on the throne of Egypt, than he became a new man; ſo that he is highly extolled for his mercy, clemency, and wiſdom. He is thought to have been the *So* mentioned in Scripture, and who entered into a league with Hoſhea king of Iſrael againſt Shalmaneſer king of Aſſyria. He is ſaid to have been excited to the invaſion of Egypt by a dream or viſion, in which he was aſſured that he ſhould hold that kingdom for 50 years. Accordingly, he conquered Egypt, as had been foretold; and at the expiration of the time above mentioned, he had another dream, in which the tutelar god of Thebes acquainted him, that he could no longer hold the kingdom of Egypt with ſafety and happineſs, unleſs he maſſacred the prieſts as he paſſed through them with his guards. Being haunted with this viſion, and at the ſame time abhorring to hold the kingdom on ſuch terms, he ſent for the prieſts, and acquainted them with what ſeemed to be the will of the gods. Upon this it was concluded, that it was the pleaſure of the Deity that Sabbaco ſhould remain no longer in Egypt; and therefore he immediately quitted that kingdom, and returned to Ethiopia.

9 Remarkable ſtory of Sethon.

Of *Anyſias*, who was Sabbaco's immediate ſucceſſor, we have no particulars worth notice. After him reigned one Sethon, who was both king and prieſt of Vulcan. He gave himſelf up to religious contemplation; and not only neglected the military claſs, but deprived them of their lands. At this they were ſo much incenſed, that they entered into an agreement not to bear arms under him; and in this ſtate of affairs Sennacherib king of Aſſyria arrived before Peluſium with a mighty army. Sethon now applied to his ſoldiers, but in vain: they unanimouſly perſiſted in refuſing to march under his banner. Being therefore deſtitute of all human aid, he applied to the god Vulcan, and requeſted him to deliver him from his enemies. Whilſt he was yet in the temple of that god, it is ſaid he fell into a deep ſleep; during which he ſaw Vulcan ſtanding at his ſide, and exhorting him to take courage. He promiſed, that if Sethon would but go out againſt the Aſſyrians, he ſhould obtain a complete victory over them. Encouraged by this aſſurance, the king aſſembled a body of artificers, ſhop-keepers, and labourers; and, with this undiſciplined rabble, marched towards Peluſium. He had no occaſion, however, to fight; for the very night after his arrival at Peluſium, an innumerable multitude of field rats entering the enemies camp, gnawed to pieces the quivers, bowſtrings, and ſhield ſtraps. Next morning, when Sethon found the enemy diſarmed, and on that account beginning to fly, he purſued them to a great diſtance, making a terrible ſlaughter. In memory of this extraordinary event, a ſtatue of Sethon was erected in the temple of Vulcan, holding in one hand a rat, and delivering theſe words: "Whoſoever beholdeth me let him be pious."

10 Reign of Pſammit chus.

Soon after the death of Sethon, the form of government in Egyt was totally changed. The kingdom was divided into twelve parts, over which as many of the chief nobility preſided. This diviſion, however, ſubſiſted but for a ſhort time. Pſammitichus, one of the twelve, dethroned all the reſt, 15 years after the diviſion had been made. The hiſtory now begins to be diveſted of fable; and from this time may be accounted equally certain with that of any other nation. The vaſt conqueſts of Seſoſtris were now no longer known; for Pſammitichus poſſeſſed no more than the country of Egypt itſelf. It appears, indeed, that none of the ſucceſſors of Seſoſtris, or even that monarch himſelf, had made uſe of any means to keep in ſubjection the countries he had once conquered. Perhaps, indeed, his deſign originally was rather to *pillage* than to conquer; and therefore, on his return, his vaſt empire vaniſhed at once. Pſammitichus, however, endeavoured to extend his dominions by making war on his neighbours; but by putting more confidence in foreign auxiliaries than in his own ſubjects, the latter were ſo much offended, that upwards of 200,000 fighting men emigrated in a body, and took up their reſidence in Ethiopia. To repair this loſs, Pſammitichus earneſtly applied himſelf to the advancement of commerce; and opened his ports to all ſtrangers, whom he greatly careſſed, contrary to the cruel maxims of his predeceſſors, who refuſed to admit them into the country. He alſo laid ſiege to the city of Azotus in Syria, which held out for 29 years againſt the whole ſtrength of the kingdom; from which we may gather, that, as a warrior, Pſammitichus was by no means remarkable. He is reported to have been the firſt king of Egypt that drank wine. He alſo ſent to diſcover the ſprings of the Nile; and is ſaid to have attempted to diſcover the moſt ancient nation in the world by the following method. Having procured two newly born children, he cauſed them to be brought up in ſuch a manner that they never heard a human voice. He imagined that theſe children would naturally ſpeak the original language of mankind: therefore, when, at two years of age, they pronounced the Phrygian word *beccos* (or ſome ſound reſembling it), which ſignifies bread, he concluded that the Phrygians were the moſt ancient people in the world.

11 Succeede by Nech

Nechus, the ſon and ſucceſſor of Pſammitichus, is the *Pharaoh-Necho* of Scripture, and was a prince of an enterpriſing and warlike genius. In the beginning of his reign, he attempted to cut through the iſthmus of Suez, between the Red ſea and the Mediterranean; but, through the invincible obſtacles which nature has thrown in the way of ſuch undertakings, he was obliged

ged to abandon the enterpriſe, after having loſt 120,000 men in the attempt. After this he ſent a ſhip, manned with ſome expert Phœnician mariners, on a voyage to explore the coaſts of Africa. Accordingly, they performed the voyage; ſailed round the continent of Africa; and after three years returned to Egypt, where their relation was deemed incredible.

12
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th Joſiah
d Nebu-
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r.

The moſt remarkable wars in which this king was engaged are recorded in the ſacred writings. He went out againſt the king of Aſſyria, by the divine command, as he himſelf told Joſiah; but being oppoſed by the king of Judea, he defeated and killed him at Megiddo; after which he ſet up, in that country, King Jehoiakim, and impoſed on him an annual tribute of 100 talents of ſilver and one talent of gold. He then proceeded againſt the king of Aſſyria; and weakened him ſo much, that the empire was ſoon after diſſolved. Thus he became maſter of Syria and Phœnicia; but in a ſhort time, Nebuchadnezzar king of Babylon came againſt him with a mighty army. The Egyptian monarch, not daunted by the formidable appearance of his antagoniſt, boldly ventured a battle; but was overthrown with prodigious ſlaughter, and Nebuchadnezzar became maſter of all the country to the very gates of Peluſium.

13
ries a
rtial and
ceſsful
nce.

The reign of Apries, the *Pharaoh-Hophra* of Scripture, preſents us with a new revolution in the Egyptian affairs. He is repreſented as a martial prince, and in the beginning of his reign very ſucceſsful. He took by ſtorm the rich city of Sidon; and having overcome the Cypriots and Phœnicians in a ſea fight, returned to Egypt laden with ſpoil. This ſucceſs probably incited Zedekiah king of Judæa to enter into an alliance with him againſt Nebuchadnezzar king of Babylon. The bad ſucceſs of this alliance was foretold by the prophet Jeremiah; and accordingly it happened. For Nebuchadnezzar having ſat down with his army before Jeruſalem, Apries marched from Egypt, with a deſign to relieve the city; but no ſooner did he perceive the Babylonians approaching him, than he retreated as faſt as he could, leaving the Jews expoſed to the rage of their mercileſs enemies; who were thereupon treated as Jeremiah had foretold; and by this ſtep Apries brought upon himſelf the vengeance denounced by the ſame prophet. The manner in which theſe predictions were fulfilled is as follows: The Cyreneans, a colony of the Greeks, being greatly ſtrengthened by a numerous ſupply of their countrymen under their third king *Battus* ſtyled *the Happy*, and encouraged by the Pythian oracle, began to drive out their Libyan neighbours, and ſhared their poſſeſſions among themſelves. Hereupon Andica king of Libya ſent a ſubmiſſive embaſſy to Apries, and implored his protection againſt the Cyreneans. Apries complied with his requeſt, and ſent a powerful army to his relief. The Egyptians were defeated with great ſlaughter; and thoſe who returned complained that the army had been ſent off by Apries in order to be deſtroyed, and that he might tyrannize without controul over the remainder of his ſubjects. This thought catching the attention of the giddy multitude, an almoſt univerſal defection enſued. Apries ſent one Amaſis, a particular friend, in whom he thought he could confide, to bring back his people to a ſenſe of their duty. But by this friend he was betrayed; for Amaſis, taking the opportunity of the preſent ferment, cauſed himſelf to be proclaimed king. Apries then deſpatched one Patarbemis, with orders to take Amaſis, and bring him alive before him. This he found impoſſible, and therefore returned without his priſoner; at which the king was ſo enraged, that he commanded Patarbemis's noſe and ears to be cut off. This piece of cruelty completed his ruin; for when the reſt of the Egyptians who continued faithful to Apries beheld the inhuman mutilation of ſo worthy and noble a perſon as Patarbemis was, they to a man deſerted Apries, and went over to Amaſis.

14
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nces of
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15
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Both parties now prepared for war; the uſurper having under his command the whole body of native Egyptians; and Apries only thoſe Ionians, Carians, and other mercenaries whom he could engage in his ſervice. The army of Apries amounted only to 30,000; but, though greatly inferior in number to the troops of his rival, as he well knew that the Greeks were much ſuperior in valour, he did not doubt of victory. Nay, ſo far was Apries puffed up with this notion, that he did not believe it was in the power even of any *god* to deprive him of his kingdom. The two armies ſoon met, and drew up in order of battle near Memphis. A bloody engagement enſued; in which, though the army of Apries behaved with the greateſt reſolution, they were at laſt overpowered with numbers, and utterly defeated, the king himſelf being taken priſoner. Amaſis now took poſſeſſion of the throne without oppoſition. He confined Apries in one of his palaces, but treated him with great care and reſpect. The people, however, were implacable, and could not be ſatisfied while he enjoyed his life. Amaſis, therefore, at laſt found himſelf obliged to deliver him into their hands. Thus the prediction received its final completion: Apries was delivered up to thoſe *who ſought his life*; and who no ſooner had him in their power, than they ſtrangled him, and laid his body in the ſepulchre of his anceſtors.

16
Apries defeated and taken priſoner by Amaſis.

17
Egypt invaded by Nebuchadnezzar.

During theſe inteſtine broils, which muſt have greatly weakened the kingdom, it is probable that Nebuchadnezzar invaded Egypt. He had been for 13 years before this employed in beſieging Tyre, and at laſt had nothing but an empty city for his pains. To make himſelf ſome amends, therefore, he entered Egypt, miſerably haraſſed the country, killed and carried away great numbers of the inhabitants, ſo that the country did not recover from the effects of this incurſion for a long time after. In this expedition, however, he ſeems not to have aimed at any permanent conqueſt, but to have been induced to it merely by the love of plunder, and of this he carried with him an immenſe quantity to Babylon.

18
Happy adminiſtration of Amaſis.

During the reign of Amaſis, Egypt is ſaid to have been perfectly happy, and to have contained 20,000 populous cities. That good order might be kept among ſuch vaſt numbers of people, Amaſis enacted a law, by which every Egyptian was bound once a-year to inform the governor of his province by what means he gained his livelihood; and if he failed of this, to put him to death. The ſame puniſhment he decreed to thoſe who could not give a ſatisfactory account of themſelves.

This monarch was a great favourer of the Greeks, and married a woman of Grecian extract. To many

Greek cities, as well as particular perſons, he made conſiderable preſents. Beſides theſe, he gave leave to the Greeks in general to come into Egypt, and ſettle either in the city of Naucratis, or carry on their trade upon the ſea coaſts; granting them alſo temples, and places where they might erect temples to their own deities. He received alſo a viſit from Solon the celebrated Athenian lawgiver, and reduced the iſland of Cyprus under his ſubjection.

19
Offends
Cambyſes
king of
Perſia.

This great proſperity, however, ended with the death of Amaſis, or indeed before it. The Egyptian monarch had ſome how or other incenſed Cambyſes king of Perſia. The cauſe of the quarrel is uncertain; but whatever it was, the Perſian monarch vowed the deſtruction of Amaſis. In the mean time *Phanes* of Halicarnaſſus, commander of the Grecian auxiliaries in the pay of Amaſis, took ſome private diſguſt; and leaving Egypt, embarked for Perſia. He was a wiſe and able general, perfectly well acquainted with every thing that related to Egypt; and had great credit with the Greeks in that country. Amaſis was immediately ſenſible how great the loſs of this man would he to him, and therefore ſent after him a truſty eunuch with a ſwift galley. Phanes was accordingly overtaken in Lycia, but not brought back; for making his guard drunk, he continued his journey to Perſia, and preſented himſelf before Cambyſes, as he was meditating the deſtruction of the Egyptian monarchy.

20
And Polycrates tyrant of
Samos.

At this dangerous criſis alſo, the Egyptian monarch imprudently made Polycrates the tyrant of Samos his enemy. This man had been the moſt remarkable perhaps of any recorded in hiſtory, for an uninterrupted courſe of ſucceſs, without the intervention of one ſingle unfortunate event. Amaſis, who was at this time in ſtrict alliance with Polycrates, wrote him a letter, in which, after congratulating him on his proſperity, he told him that he was afraid leſt his ſucceſſes were too many, and he might be ſuddenly thrown down into the greateſt miſery. For this reaſon he adviſed him voluntarily to take away ſomething from his own happineſs; and to caſt away that which would grieve him moſt if he was accidentally to loſe it. Polycrates followed his advice, and threw into the ſea a ſignet of ineſtimable value. This, however, did not anſwer the intended purpoſe. The ſignet happened to be ſwallowed by a fiſh, which was taken a few days afterwards, and thus was reſtored to Polycrates. Of this Amaſis was no ſooner informed, than, conſidering Polycrates as really *unhappy*, and already on the brink of deſtruction, he reſolved to put an end to the friendſhip which ſubſiſted between them. For this purpoſe he deſpatched a herald to Samos, commanding him to acquaint Polycrates, that he renounced his alliance, and all the obligations between them; that he might not mourn his misfortunes with the ſorrow of a friend. Thus Amaſis left Polycrates at liberty to act againſt him, if he choſe to do ſo; and accordingly he offered to aſſiſt Cambyſes with a fleet of ſhips in his Egyptian expedition.

21
Egypt invaded by
Cambyſes.

Amaſis had not, however, the misfortune to ſee the calamities of his country. He died about 525 years before Chriſt, after a reign of 44 years; and left the kingdom to his ſon Pſammenitus, juſt as Cambyſes was approaching the frontiers of the kingdom. The new prince was ſcarce ſeated on the throne, when the Perſians appeared. Pſammenitus drew together what forces he could, in order to prevent them from entering the kingdom. Cambyſes, however, immediately laid ſiege to Peluſium, and made himſelf maſter of it by the following ſtratagem: he placed in the front of his army a great number of cats, dogs, and other animals that were deemed ſacred by the Egyptians. He then attacked the city, and took it without oppoſition; the garriſon, which conſiſted entirely of Egyptians, not daring to throw a dart or ſhoot an arrow againſt their enemies, leſt they ſhould kill ſome of the holy animals.

22
Cruelty
defeat of
the Egy
tians.

Cambyſes had ſcarce taken poſſeſſion of the city, when Pſammenitus advanced againſt him with a numerous army. But before the engagement, the Greeks who ſerved under Pſammenitus, to ſhow their indignation againſt their treacherous countryman Phanes, brought his children into the camp, killed them in the preſence of their father and of the two armies, and then drank their blood. The Perſians enraged at ſo cruel a ſight, fell upon the Egyptians with the utmoſt fury, put them to flight, and cut the greateſt part of them in pieces. Thoſe who eſcaped fled to Memphis, where they were ſoon after guilty of a horrid outrage. Cambyſes ſent a herald to them in a ſhip from Mitylene: but no ſooner did they ſee her come into the port, than they flocked down to the ſhore, deſtroyed the ſhip, and tore to pieces the herald and all the crew; afterwards carrying their mangled limbs into the city, in a kind of barbarous triumph. Not long after, they were obliged to ſurrender: and thus Pſammenitus fell into the hands of his inveterate enemy, who was now enraged beyond meaſure at the cruelties exerciſed upon the children of Phanes, the herald, and the Mitylenean ſailors.

23
Their
dreadful
puniſhm
by Camb
ſes.

The rapid ſucceſs of the Perſians ſtruck with ſuch terror the Libyans, Cyreneans, Barcæans, and other dependents or allies of the Egyptian monarch, that they immediately ſubmitted. Nothing now remained but to diſpoſe of the captive king, and revenge on him and his ſubjects the cruelties which they had committed. This the mercileſs victor executed in the ſevereſt manner. On the 10th day after Memphis had been taken, Pſammenitus and the chief of the Egyptian nobility were ignominiouſly ſent into one of the ſuburbs of that city. The king being there ſeated in a proper place, ſaw his daughter coming along in the habit of a poor ſlave with a pitcher to fetch water from the river, and followed by the daughters of the greateſt families in Egypt, all in the ſame miſerable garb, with pitchers in their hands, drowned in tears, and loudly bemoaning their miſerable ſituation. When the fathers ſaw their daughters in this diſtreſs, they burſt into tears, all but Pſammenitus, who only caſt his eyes on the ground and kept them fixed there. After the young women, came the ſon of Pſammenitus, with 2000 of the young nobility, all of them with bits in their mouths and halters round their necks, led to execution. This was done to expiate the murder of the Perſian herald and the Mitylenean ſailors; for Cambyſes cauſed ten Egyptians of the firſt rank to be publicly executed for every one of thoſe that had been ſlain. Pſammenitus, however, obſerved the ſame conduct as before, keeping his eyes ſtedfaſtly fixed on the ground, though all the Egyptians around him made the loudeſt lamentations,

tions. A little after this he ſaw an intimate friend and companion, now advanced in years, who having been plundered of all he had, was begging his bread from door to door in the ſuburbs. As ſoon as he ſaw this man, Pſammenitus wept bitterly; and calling out to him by his name, ſtruck himſelf on the head as if he had been frantic. Of this the ſpies who had been ſet over him to obſerve his behaviour, gave immediate notice to Cambyſes, who thereupon ſent a meſſenger to inquire the cauſe of ſuch immoderate grief. Pſammenitus anſwered, That the calamities of his own family confounded him, and were too great to be lamented by any outward ſigns of grief; but the extreme diſtreſs of a boſom friend gave more room for reflection, and therefore extorted tears from him. With this anſwer Cambyſes was ſo affected, that he ſent orders to prevent the execution of the king's ſon; but theſe came too late, for the young prince had been put to death before any of the reſt. Pſammenitus himſelf was then ſent for into the city, and reſtored to his liberty: and had he not ſhowed a deſire of revenge, might perhaps have been truſted with the government of Egypt; but being diſcovered hatching ſchemes againſt the government, he was ſeized, and condemned to drink bull's blood.

4 t be- s a nce of erſian, fter- s of recian e.

The Egyptians were now reduced to the loweſt degree of ſlavery. Their country became a province of the Perſian empire: the body of Amaſis their late king was taken out of his grave; and after being mangled in a ſhocking manner was finally burnt. But what ſeemed more grievous than all the reſt, their god Apis was ſlain, and his prieſts ignominiouſly ſcourged; and this inſpired the whole nation with ſuch a hatred to the Perſians, that they could never afterwards be reconciled to them. As long as the Perſian empire ſubſiſted, the Egyptians could never ſhake off their yoke. They frequently revolted indeed, but were always overthrown with prodigious loſs. At laſt they ſubmitted, without oppoſition, to Alexander the Great: after his death, Egypt again became a powerful kingdom; though ſince the conqueſt of it by Cambyſes to the preſent time it hath never been governed but by foreign princes, agreeable to the prophecy of Ezekiel, "There ſhall be no more a prince of the land of Egypt."

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On the death of Alexander the Great, Egypt, together with Libya, and that part of Arabia which borders on Egypt, were aſſigned to Ptolemy Lagus as governor under Alexander's ſon by Roxana, who was but newly born. Nothing was farther from the intention of this governor, than to keep the provinces in truſt for another. He did not, however, aſſume the title of *king*, till he perceived his authority ſo firmly eſtabliſhed that it could not be ſhaken; and this did not happen till 19 years after the death of Alexander, when Antigonus and Demetrius had unſucceſsfully attempted the conqueſt of Egypt.

From the time of his firſt eſtabliſhment on the throne, Ptolemy, who had aſſumed the title of *Soter*, reigned 20 years; which added to the former 19, make up the 39 years which hiſtorians commonly allow him to have reigned alone.—In the 39th year of his reign, he made one of his ſons, named *Philadelphus*, partner to the empire; declaring him his ſucceſſor, to the prejudice of his eldeſt ſon named *Ceraunus*; being excited thereto by his violent love for *Berenice* Philadelphus's mother. When the ſucceſſion was thus ſettled, Ceraunus immediately quitted the court; and fled at laſt into Syria, where he was received with open arms by Seleucus Nicator, whom he afterwards murdered.

The moſt remarkable tranſaction of this reign was the embelliſhing of the city of Alexandria, which Ptolemy made the capital of his new kingdom, and of which an account is given under the article ALEXANDRIA. About 284 years before Chriſt, died Ptolemy Soter, in the 41ſt year of his reign, and 84th of his age. He was the beſt prince of his race; and left behind him an example of prudence, juſtice, and clemency which few of his ſucceſſors choſe to follow. Beſides the provinces originally aſſigned to him, he has added to his empire thoſe of Cælo-Syria, Ethiopia, Pamphylia, Lycia, Caria, and ſome of the Cyclades. His ſucceſſor, Ptolemy Philadelphus, added nothing to the extent of the empire; nor did he perform any thing worthy of notice except embelliſhing further the city of Alexandria, and entering into an alliance with the Romans. In his time, one Magas, the governor of Libya and Cyrene, revolted: and held theſe provinces as an independent prince, notwithſtanding the utmoſt efforts of Ptolemy to reduce him. At laſt an accommodation took place; and a marriage was propoſed between Berenice, the only daughter of Magas, and Ptolemey's eldeſt ſon. The young princeſs was to receive all her father's dominions by way of dowry, and thus they would again be brought under the dominion of Ptolemy's family. But before this treaty could be put in execution, Magas died; and then Apamea, the princeſs's mother, did all ſhe could to prevent the match. This, however, ſhe was not able to do; though her efforts for that purpoſe produced a deſtructive war of four years continuance with Antiochus Theus king of Syria, and the acting of a cruel tragedy in the family of the latter. See SYRIA.

26 Succeeded by Philadelphus.

27 Ptolemy Euergetes a great conqueror.

About 246 years before Chriſt, Ptolemy Philadelphus died; and was ſucceeded by his eldeſt ſon Ptolemy, who had been married to Berenice the daughter of Magas as above related. In the beginning of his reign, he found himſelf engaged in a war with Antiochus Theus king of Syria. From this he returned victorious, and brought with him 2500 ſtatues and pictures, among which were many of the ancient Egyptian idols, which had been carried away of Cambyſes into Perſia. Theſe were reſtored by Ptolemy to their ancient temples; in memory of which favonr, the Egyptians gave him the ſurname of *Euergetes*, or the Beneficent. In this expedition he greatly enlarged his dominions, making himſelf maſter of all the countries that lie between Mount Taurus and the confines of India. An account of theſe conqueſts was given by himſelf, inſcribed on a monument, to the following effect. "Ptolemy Euergetes, having received from his father the ſovereignty of Egypt, Libya, Syria, Phœnice, Cyprus, Lycia, Caria, and the other Cyclades, aſſembled a mighty army of horſe and foot, with a great fleet, and elephants, out of Trogloditia and Ethiopia; ſome of which had been taken by his father, and the reſt by himſelf, and brought from thence, and trained up for war; with this great force he ſailed into Aſia; and having conquered all the provinces which lie on this ſide the Euphrates, Cilicia, Pamphylia, Ionia, the Helleſpont,

Helleſpont, and Thrace, he croſſed that river with all the forces of the conquered countries, and the kings of thoſe nations, and reduced Meſopotamia, Babylonia, Suſiana, Perſia, Media, and all the country as far as Bactria."

On the king's return from this expedition, he paſſed through Jeruſalem, where he offered many ſacrifices to the God of Iſrael, and ever afterwards expreſſed a great favour for the Jewiſh nation. At this time, the Jews were tributaries to the Egyptian monarchs, and paid them annually 20 talents of ſilver. This tribute, however, Onias, who was then high prieſt, being of a very covetous diſpoſition, had for a long time neglected to pay, ſo that the arrears amounted to a very large ſum. Soon after his return, therefore, Ptolemy ſent one of his courtiers named *Athenion* to demand the money, and deſired him to acquaint the Jews that he would make war upon them in caſe of a refuſal. A young man, however, named *Joſeph*, nephew to Onias, not only found means to avert the king's anger, but even got himſelf choſen his receiver general, and by his faithful diſcharge of that important truſt, continued in high favour with Ptolemy as long as he lived.

28 Cleomenes king of Sparta takes refuge in Egypt.

Ptolemy Euergetes having at laſt concluded a peace with Seleucus the ſucceſſor of Antiochus Theus king of Syria, attempted the enlargement of his dominions on the ſouth ſide. In this he was attended with ſuch ſucceſs, that he made himſelf maſter of all the coaſts of the Red ſea, both on the Arabian and Ethiopian ſides, quite down to the ſtraits of Babelmandel. On his return he was met by ambaſſadors from the Achæans, imploring his aſſiſtance againſt the Etolians and Lacedemonians. This the king readily promiſed them: but they having in the mean time engaged Antigonus king of Macedon to ſupport them, Ptolemy was ſo much offended, that he ſent powerful ſuccours to Cleomenes king of Sparta; hoping, by that means, to humble both the Achæans and their new ally Antigonus. In this, however, he was diſappointed; for Cleomenes, after having gained very conſiderable advantages over the enemy, was at laſt entirely defeated in the battle of Sellaſia, and obliged to take refuge in Ptolemy's dominions. He was received by the Egyptian monarch with the greateſt demonſtrations of kindneſs; a yearly penſion of 24 talents was aſſigned him, with a promiſe of reſtoring him to the Spartan throne; but before this could be accompliſhed, the king of Egypt died, in the 27th year of his reign, and was ſucceeded by his ſon Ptolemy Philopater.

29 Ptolemy Philopater a cruel tyrant.

Thus we have ſeen the Egyptian empire brought to a very great height of power; and had the ſucceeding monarchs been careful to preſerve that ſtrength of empire tranſmitted to them by Euergetes, it is very probable that Egypt might have been capable of holding the balance againſt Rome, and after the deſtruction of Carthage prevented that haughty city from becoming miſtreſs of the world. But after the death of Ptolemy Euergetes, the Egyptian empire, being governed only by weak or vicious monarchs, quickly declined, and from that time makes no conſpicuous figure in hiſtory. Ptolemy Philopater began his reign with the murder of his brother; after which, giving himſelf up to all manner of licentiouſneſs, the kingdom fell into a kind of anarchy. Cleomenes the Spartan king ſtill reſided at court; and being now unable to bear the diſſolute manners which prevailed there, he preſſed Philopater to give him the aſſiſtance he had promiſed for reſtoring him to the throne of Sparta. This he the rather inſiſted upon, becauſe he had received advice that Antigonus king of Macedon was dead, that the Achæans were engaged in a war with the Etolians, and that the Lacedemonians had joined the latter againſt the Achæans and Macedonians. Ptolemy, when afraid of his brother Magas, had indeed promiſed to aſſiſt the king of Sparta with a powerful fleet, hoping by this means to attach him to his own intereſt; but now when Magas was out of the way, it was determined by the king, or rather his miniſters, that Cleomenes ſhould not be aſſiſted, nor even allowed to leave the kingdom; and this extravagant reſolution produced the deſperate attempt of Cleomenes, of which an account is given in the hiſtory of SPARTA.

Of the diſorders which now enſued in the government, Antiochus king of Syria, ſurnamed *the Great*, took the advantage, and attempted to wreſt from Ptolemy the provinces of Cælo-Syria and Paleſtine. But in this he was finally diſappointed; and might eaſily have been totally driven out of Syria, had not Ptolemy been too much taken up with his debaucheries to think of carrying on the war. The diſcontent occaſioned by this piece of negligence ſoon produced a civil war in his dominions, and the whole kingdom continued in the utmoſt confuſion till his death, which happened in the 17th year of his reign and 37th of his age.

3 Extrao nary ſ concer the Je

During the reign of Philopater happened a very extraordinary event with regard to the Jews, which is mentioned in the Maccabees *. The king of Egypt, while on his Syrian expedition, had attempted to enter the temple of Jeruſalem; but being hindered by the Jews, he was filled with the utmoſt rage againſt the whole nation. On his return to Alexandria, he reſolved to make thoſe who dwelt in that city feel the firſt effects of his vengeance. He began with publiſhing a decree, which he cauſed to be engraved on a pillar erected for that purpoſe at the gate of his palace, excluding all thoſe who did not ſacrifice to the gods worſhipped by the king. By this means the Jews were debarred from ſuing to him for juſtice, or obtaining his protection when they happened to ſtand in need of it. By the favour of Alexander the Great, Ptolemy Soter, and Euergetes, the Jews enjoyed at Alexandria the ſame privileges with the Macedonians. In that metropolis the inhabitants were divided into three ranks or claſſes. In the firſt were the Macedonians, or original founders of the city, and along with them were enrolled the Jews; in the ſecond were the mercenaries who had ſerved under Alexander; and in the third the native Egyptians. Ptolemy now, to be revenged of the Jews, ordered, by another decree, that they ſhould be degraded from the firſt rank, and enrolled among the native Egyptians. By the ſame decree it was enacted, that all of that nation ſhould appear at an appointed time before the proper officers, in order to be enrolled among the common people; that at the time of their enrollment they ſhould have the mark of an ivy leaf, the badge of Bacchus, impreſſed with a hot iron on their faces; that all who were thus marked ſhould be made ſlaves; and, laſtly, that if any one ſhould ſtand out againſt this decree, he ſhould be

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* Lib. 3, 4, 5

immediately put to death. That he might not, however, ſeem an enemy to the whole nation, he declared, that thoſe who ſacrificed to his gods ſhould enjoy their former privileges, and remain in the ſame claſs. Yet, notwithſtanding this tempting offer, 300 only out of many thouſand Jews who lived in Alexandria could be prevailed upon to abandon their religion in order to ſave themſelves from ſlavery.

The apoſtates were immediately excommunicated by their brethren: and this their enemies conſtrued as done in oppoſition to the king's order; which threw the tyrant into ſuch a rage, that he reſolved to extirpate the whole nation, beginning with the Jews who lived in Alexandria and other cities of Egypt, and proceeding from thence to Judæa and Jeruſalem itſelf. In conſequence of this cruel reſolution, he commanded all the Jews that lived in any part of Egypt to be brought in chains to Alexandria, and there to be ſhut up in the Hippodrome, which was a very ſpacious place without the city, where the people uſed to aſſemble to ſee horſe races and other public diverſions. He then ſent for Herman maſter of the elephants; and commanded him to have 500 of theſe animals ready againſt the next day, to let looſe upon the Jews in the Hippodrome. But when the elephants were prepared for the execution, and the people were aſſembled in great crowds to ſee it, they were for that day diſappointed by the king's abſence. For, having been late up the night before with ſome of his debauched companions, he did not awake till the time for the ſhow was over, and the ſpectators returned home. He therefore ordered one of his ſervants to call him early on the following day, that the people might not meet with a ſecond diſappointment. But when the perſon awaked him according to his order, the king was not yet returned to his ſenſes; having withdrawn, exceedingly drunk, only a ſhort time before. As he did not remember the order, he therefore fell into a violent paſſion, and threatened with death the ſervant who had awaked him; and this cauſed the ſhow to be put off till the third day. At laſt the king came to the Hippodrome attended with a vaſt multitude of ſpectators; but when the elephants were let looſe, inſtead of falling upon the Jews, they turned their rage againſt the ſpectators and ſoldiers, and deſtroyed great numbers of them. At the ſame time, ſome frightful appearances which were ſeen in the air ſo terrified the king, that he commanded the Jews to be immediately ſet at liberty, and reſtored them to their former privileges. No ſooner were they delivered from this danger than they demanded leave to put to death ſuch of their nation as had abandoned their religion; and this being granted, they deſpatched the apoſtates without excepting a ſingle man.

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Philopater was ſucceeded by Ptolemy Epiphanes; and he, after a reign of 24 years, by Ptolemy Philometor. In the beginning of his reign, a war commenced with the king of Syria, who had ſeized on the provinces of Cælo-Syria and Paleſtine in the preceding reign. In the courſe of this war, Philometor was either voluntarily delivered up to Antiochus or taken priſoner. But however this was, the Alexandrians deſpairing of his ever being able to recover his liberty, raiſed to the throne his brother Ptolemy, who took the name of *Euergetes II.* but was afterwards called *Phyſcon* or "the great bellied," on account of the prominent belly which by his gluttony and luxury he had acquired. He was ſcarce ſeated on the throne, however, when Antiochus Epiphanes, returning into Egypt, drove out Phyſcon, and reſtored the whole kingdom except Peluſium, to Philometor. His deſign was to kindle a war betwixt the two brothers ſo that he might have an opportunity of ſeizing the kingdom for himſelf. For this reaſon he kept to himſelf the city of Peluſium; which being the key of Egypt, he might at his pleaſure re-enter the country. But Philometor, appriſed of his deſign, invited his brother Phyſcon to an accommodation; which was happily effected by their ſiſter Cleopatra. In virtue of this agreement, the brothers were to reign jointly, and to oppoſe to the utmoſt of their power Antiochus, whom they conſidered as a common enemy. On this the king of Syria invaded Egypt with a mighty army, but was prevented by the Romans from conquering it.

Egypt.

32 Philometor reſtored, and reigns jointly with his brother.

33 Difference between the two brothers decided by the Roman ſenate.

The two brothers were no ſooner freed from the apprehenſions of a foreign enemy than they began to quarrel with each other. Their differences ſoon came to ſuch a height, that the Roman ſenate interpoſed. But before the ambaſſadors employed to inquire into the merits of the cauſe could arrive in Egypt, Phyſcon had driven Philometor from the throne, and obliged him to quit the kingdom. On this the dethroned prince fled to Rome, where he appeared meanly dreſſed, and without attendants. He was very kindly received by the ſenate; who were ſo well ſatisfied of the injuſtice done him, that they immediately decreed his reſtoration. He was reconducted accordingly; and, on the arrival of the ambaſſadors in Egypt, an accommodation between the two brothers was negotiated. By this agreement, Phyſcon was put in poſſeſſion of Libya and Cyrene, and Philometor of all Egypt and the iſland of Cyprus; each of them being declared independent of the other in the dominion allotted to them. The treaty, as uſual, was confirmed with oaths and ſacrifices, and was broken almoſt as ſoon as made. Phyſcon was diſſatisfied with his ſhare of the dominions; and therefore ſent ambaſſadors to Rome, deſiring that the iſland of Cyprus might be added to his other poſſeſſions. This could not be obtained by the ambaſſadors; and therefore Phyſcon went to Rome in perſon. His demand was evidently unjuſt; but the Romans, conſidering that it was their intereſt to weaken the power of Egypt as much as poſſible, without further ceremony adjudged the iſland to him.

34 Iſland of Cyprus adjudged to Phyſcon.

Phyſcon ſet out from Rome with two ambaſſadors; and arriving in Greece on his way to Cyprus, he raiſed there a great number of mercenaries, with a deſign to ſail immediately to that iſland and conquer it. But the Roman ambaſſadors telling him, that they were commanded to put him in poſſeſſion of it by fair means and not by force, he diſmiſſed his army, and returned to Libya, while one of the ambaſſadors proceeded to Alexandria. Their deſign was to bring the two brothers to an interview on the frontiers of their dominions, and there to ſettle matters in an amicable manner. But the ambaſſador who went to Alexandria, found Philometor very averſe from compliance with the decree of the ſenate. He put off the ambaſſador ſo long, that Phyſcon ſent the other alſo to Alexandria, hoping that the joint perſuaſions of the two would induce

Egypt.

duce Philometor to comply. But the king, after entertaining them at an immenſe charge for 40 days, at laſt plainly refuſed to ſubmit, and told the ambaſſadors that he was reſolved to adhere to the firſt treaty. With this anſwer the Roman ambaſſadors departed, and were followed by others from the two brothers. The ſenate, however, not only confirmed their decree in favour of Phyſcon, but renounced their alliance with Philometor, and commanded his ambaſſador to leave the city in five days.

35 Philometor refuſes to comply.

36 Rebellion againſt Phyſcon.

In the mean time, the inhabitants of Cyrene having heard unfavourable accounts of Phyſcon's behaviour during the ſhort time he reigned in Alexandria, conceived ſo ſtrong an averſion againſt him, that they reſolved to keep him out of their country by force of arms. On receiving intelligence of this reſolution, Phyſcon dropped all thoughts of Cyprus for the preſent; and haſtened with all his forces to Cyrene, where he ſoon got the better of his rebellious ſubjects, and eſtabliſhed himſelf in the kingdom. His vicious and tyrannical conduct, however, ſoon eſtranged from him the minds of his ſubjects, in ſuch a manner, that ſome of them entering into a conſpiracy againſt him, fell upon him one night as he was returning to his palace, wounded him in ſeveral places, and left him for dead on the ſpot. This he laid to the charge of his brother Philometor; and as ſoon as he was recovered, took another voyage to Rome. Here he made his complaints to the ſenate, and ſhowed them the ſcars of his wounds, accuſing his brother of having employed the aſſaſſins from whom he received them. Though Philometor was known to be a man of a moſt humane and mild diſpoſition, and therefore very unlikely to have been concerned in ſo black an attempt; yet the ſenate, being offended at his refuſing to ſubmit to their decree concerning the iſland of Cyprus, hearkened to this falſe accuſation; and carried their prejudice ſo far, that they not only refuſed to hear what his ambaſſadors had to ſay, but ordered them immediately to depart from the city. At the ſame time, they appointed five commiſſioners to conduct Phyſcon into Cyprus, and put him in poſſeſſion of that iſland, enjoining all their allies in thoſe parts to ſupply him with forces for that purpoſe.

Phyſcon having by this means got together an army which ſeemed to him to be ſufficient for the accompliſhment of his deſign, landed in Cyprus; but being there encountered by Philometor in perſon, he was entirely defeated, and obliged to ſhelter himſelf in a city called *Lapitho*. Here he was cloſely beſieged, and at laſt obliged to ſurrender. Every one now expected that Phyſcon would have been treated as he deſerved; but his brother, inſtead of puniſhing, reſtored him to the government of Libya and Cyrene, adding ſome other territories inſtead of the iſland of Cyprus, and promiſing him his daughter in marriage. Thus an end was put to the war between the two brothers; for the Romans were aſhamed any longer to oppoſe a prince who had given ſuch a ſignal inſtance of his juſtice and clemency.

37 He is defeated and taken priſoner by Philometor

On his return to Alexandria, Philometor appointed one Archias governor of Cyprus. But he, ſoon after the king's departure, agreed with Demetrius king of Syria, to betray the iſland to him for 500 talents. The treachery was diſcovered before it took effect; and the traitor, to avoid the puniſhment due to his crime, laid violent hands on himſelf. Ptolemy being offended with Demetrius for this attempt on Cyprus, joined Attalus king of Pergamus, and Ariarathes king of Cappadocia, in ſetting up a pretender to the crown of Syria. This was Alexander Balas; to whom he even gave his daughter Cleopatra in marriage, after he had placed him on the throne of Syria. But he, notwithſtanding theſe and many other favours, being ſuſpected of having entered into a plot againſt his benefactor, Ptolemy became his greateſt enemy; and marching againſt him, routed his army in the neighbourhood of Antioch. He did not, however, long enjoy his victory; for he died in a few days after the engagement, of the wounds he had received.

Deat Philo tor.

On the death of Philometor, Cleopatra the queen deſigned to ſecure the throne for her ſon. But ſome of the principal nobility declaring for Phyſcon, a civil war was about to enſue, when matters were compromiſed on condition that Phyſcon ſhould marry Cleopatra, that he ſhould reign jointly with her during his life, and declare her ſon by Philometor heir to the crown. Theſe terms were no ſooner agreed upon than Phyſcon married Cleopatra, and, on the very day of the nuptials, murdered her ſon in her arms. This was only a prelude to the cruelties which he afterwards practiſed on his ſubjects. He was no ſooner ſeated on the throne, than he put to death all thoſe who had ſhown any concern for the murder of the young prince. He then wreaked his fury on the Jews, whom he treated more like ſlaves than ſubjects, on account of their having favoured the cauſe of Cleopatra. His own people were treated with little more ceremony. Numbers of them were every day put to death for the ſmalleſt faults, and often for no fault at all, but merely to gratify his inhuman temper. His cruelty towards the Alexandrians is particularly mentioned under the article ALEXANDRIA. In a ſhort time, being wearied of his queen, who was alſo his ſiſter, he divorced her; and married her daughter, who was alſo called *Cleopatra*, and whom he had previouſly raviſhed. In ſhort, his behaviour was ſo exceedingly wicked, that it ſoon became quite intolerable to his ſubjects; and he was obliged to fly to the iſland of Cyprus with his new queen, and *Memphitis*, a ſon he had by her mother.

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4 He is en ou

On the flight of the king, the divorced queen was placed on the throne by the Alexandrians; but Phyſcon, fearing leſt a ſon whom he had left behind ſhould be appointed king, ſent for him into Cyprus, and cauſed him to be aſſaſſinated as ſoon as he landed. This provoked the people againſt him to ſuch a degree, that they pulled down and daſhed to pieces all the ſtatues which had been erected to him in Alexandria. This the tyrant ſuppoſed to have been done at the inſtigation of the queen, and therefore reſolved to revenge it on her by killing his own ſon whom he had by her. He therefore, without the leaſt remorſe, cauſed the young prince's throat to be cut; and having put his mangled limbs into a box, ſent them as a preſent to his mother Cleopatra. The meſſenger with whom this box was ſent, was one of his guards. He was ordered to wait till the queen's birthday, which approached, and was to be celebrated with extraordinary pomp; and in the midſt of the general rejoicing, he was to deliver the preſent.

4 Murd his ſo

The horror and deteſtation occaſioned by this unexampled piece of cruelty cannot be expreſſed. An army pt.

army was ſoon raiſed, and the command of it given to one *Marſyas*, whom the queen had appointed general, and enjoined to take all the neceſſary ſteps for the defence of the country. On the other hand, Phyſcon, having hired a numerous body of mercenaries, ſent them, under the command of one *Hegelochus*, againſt the Egyptians. The two armies met on the frontiers of Egypt, on which a bloody battle enſued; but at laſt the Egyptians were entirely defeated, and Marſyas was taken priſoner. Every one expected that the captive general would have been put to death with the ſevereſt torments; but Phyſcon, perceiving that his cruelties only exaſperated the people, reſolved to try whether he could regain their affections by lenity; and therefore pardoned Marſyas, and ſet him at liberty.—Cleopatra, in the mean time, being greatly diſtreſſed by this overthrow, demanded aſſiſtance from Demetrius king of Syria, who had married her eldeſt daughter by Philometor, promiſing him the crown of Egypt for his reward. Demetrius accepted the propoſal without heſitation, marched with all his forces into Egypt, and there laid ſiege to Peluſium. But he being no leſs hated in Syria than Phyſcon was in Egypt, the people of Antioch, taking advantage of his abſence, revolted againſt him, and were joined by moſt of the other cities in Syria. Thus Demetrius was obliged to return; and Cleopatra, being now in no condition to oppoſe Phyſcon, fled to Ptolemais, where her daughter the queen of Syria at that time reſided. Phyſcon was then reſtored to the throne of Egypt, which he enjoyed without further moleſtation till his death; which happened at Alexandria, in the 29th year of his reign, and 67th of his age.

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To Phyſcon ſucceeded Ptolemy Lathyrus, about 122 years before Chriſt; but he had not reigned long, before his mother, finding that he would not be entirely governed by her, by falſe ſurmiſes ſtirred up the Alexandrians, who drove him from the throne, and placed on it his youngeſt brother Alexander. Lathyrus after this was obliged to content himſelf with the government of Cyprus, which he was permitted to enjoy in quiet. Ptolemy Alexander, in the mean time, finding he was to have only the ſhadow of ſovereignty, and that his mother Cleopatra was to have all the power, ſtole away privately from Alexandria. The queen uſed every artifice to bring him back, as well knowing that the Alexandrians would never ſuffer her to reign alone. At laſt her ſon yielded to her entreaties; but ſoon after, underſtanding that ſhe had hired aſſaſſins to deſpatch him, he cauſed her to be murdered.

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The death of the queen was no ſooner known to the Alexandrians, than, diſdaining to be commanded by a parricide, they drove out Alexander, and recalled Lathyrus.—The depoſed prince for ſome time led a rambling life in the iſland of Cos; but having got together ſome ſhips, he, the next year, attempted to return into Egypt. But being met by *Tyrrhus*, Lathyrus's admiral, he was defeated, and obliged to fly to Myra in Lycia. From Myra he ſteered his courſe towards Cyprus, hoping that the inhabitants would place him on the throne, inſtead of his brother. But *Chareas*, another of Lathyrus's admirals, coming up with him while he was ready to land, an engagement enſued, in which Alexander's fleet was diſperſed, and he himſelf killed.

Egypt.

45
Cyrenaica
bequeathed
to the Romans.

During theſe diſturbances, *Apion* king of Cyrenaica, the ſon of Ptolemy Phyſcon by a concubine, having maintained peace and tranquillity in his dominions during a reign of 21 years, died, and by his will left his kingdom to the Romans: and thus the Egyptian empire was conſiderably reduced and circumſcribed.

46
City of
Thebes
ruined.

Lathyrus being now delivered from all competitors, turned his arms againſt the city of Thebes, which had revolted from him. The king marched in perſon againſt the rebels; and, having defeated them in a pitched battle, laid cloſe ſiege to their city. The inhabitants defended themſelves with great reſolution for three years. At laſt, however, they were obliged to ſubmit, and the city was given up to be plundered by the ſoldiery. They left everywhere the moſt melancholy monuments of their avarice and cruelty; ſo that Thebes, which till that time had been one of the moſt wealthy cities of Egypt, was now reduced ſo low that it never afterwards made any figure.

47
Alexander
II. ſucceeds
Lathyrus.

About 76 years before Chriſt, Ptolemy Lathyrus was ſucceeded by Alexander II. He was the ſon of the Ptolemy Alexander for whom Lathyrus had been driven out; and had met with many adventures. He was firſt ſent by Cleopatra into the iſland of Cos, with a great ſum of money, and all her jewels; as thinking that was the ſafeſt place where they could be kept. When Mithridates king of Pontus made himſelf maſter of that iſland, the inhabitants delivered up to him the young Egyptian prince, together with all the treaſures. Mithridates gave him an education ſuitable to his birth; but he, not thinking himſelf ſafe with a prince who had ſhed the blood of his own children, fled to the camp of Sylla the Roman dictator, who was then making war in Aſia. From that time he lived in the family of the Roman general, till news was brought to Rome of the death of Lathyrus. Sylla then ſent him to Egypt to take poſſeſſion of the throne. But, before his arrival, the Alexandrians had choſen Cleopatra for their ſovereign. To compromiſe matters, however, it was agreed, that Ptolemy ſhould marry her, and take her for his partner in the throne. This was accordingly done; and 19 days after the marriage, the unhappy queen was murdered by her huſband, who for 15 years afterwards ſhowed himſelf ſuch a monſter of wickedneſs, that a general inſurrection at laſt enſued among his ſubjects, and he was obliged to fly to Pompey the Great, who was then carrying on the war againſt Mithridates king of Pontus. But Pompey refuſing to concern himſelf in the matter, he retired to the city of Tyre, where he died ſome months after.

48
Marries
Cleopatra,
and murders her.

49
Leaves his
kingdom
to the Romans.

When he was forced to ſhut himſelf up in the city of Tyre, Alexander had ſent ambaſſadors to Rome, in order to influence the ſenate in his favour. But, dying before the negotiation was finiſhed, he made over by his laſt will all his rights to the Roman people, declaring them heirs to his kingdom: not out of any affection to the republic; but with a view to raiſe diſputes between the Romans and his rival Auletes, whom the Egyptians had placed on the throne. The will was brought to Rome, where it occaſioned warm debates. Some were for taking immediate poſſeſſion of the kingdom. Others thought that no notice ſhould be taken of ſuch a will, becauſe Alexander had no right to diſpoſe of his dominions in prejudice of his ſucceſſor, and to exclude from the crown thoſe who were of of the royal family of Egypt. Cicero repreſented, that ſuch a notorious impoſition would debaſe the majeſty of the Roman people, and involve them in endleſs wars and diſputes; that the fruitful fields of Egypt would be a ſtrong temptation to the avarice of the people, who would inſiſt on their being divided among them; and laſtly, that by this means the bloody quarrels about the Agrarian laws would be revived. Theſe reaſons had ſome weight with the ſenate; but what chiefly prevented them from ſeizing on Egypt at this time was, that they had lately taken poſſeſſion of the kingdom of Bithynia in virtue of the will of Nicomedes, and of Cyrene and Libya by the will of Apion. They thought, therefore, that if they ſhould, on the like pretence, take poſſeſſion of the kingdom of Egypt, this might too much expoſe their deſign of ſetting up a kind of univerſal monarchy, and occaſion a formidable combination againſt them.

50
Character of Auletes the new king.

Auletes, who was now raiſed to the throne by the Egyptians, is ſaid to have ſurpaſſed all the kings that went before him in the effeminacy of his manners. The name *Auletes*, which ſignifies the *flute-player*, was given him becauſe he piqued himſelf on his ſkill in performing upon that inſtrument, and was not aſhamed even to contend for the prize in the public games. He took great pleaſure in imitating the manners of the Bacchanals; dancing in a female dreſs, and in the ſame meaſures that they uſed during the ſolemnity of their god Bacchus; and hence he had the ſurname of the *New Dionyſius* or *Bacchus*. As his title to the crown was diſputable (he being only the ſon of a concubine), the firſt care of Auletes was to get himſelf acknowledged by the Romans, and declared their ally. This was obtained by applying to Julius Cæſar, who was at that time conſul, and immenſely in debt, Cæſar being glad of ſuch an opportunity of raiſing money, made the king of Egypt pay pretty dear for his alliance. Six thouſand talents, a ſum equal to 1,162,500l. Sterling, were paid partly to Cæſar himſelf, and partly to Pompey, whoſe intereſt was neceſſary for obtaining the conſent of the people. Though the revenues of Egypt amounted to twice this ſum, yet Auletes found it impoſſible for him to raiſe it without ſeverely taxing his ſubjects. This occaſioned a general diſcontent; and while the people were almoſt ready to take up arms, a moſt unjuſt decree paſſed at Rome for ſeizing the iſland of Cyprus. When the Alexandrians heard of the intentions of the republic, they preſſed Auletes to demand that iſland as an ancient appendage of Egypt; and, in caſe of a refuſal, to declare war againſt that haughty and imperious people, who, they now ſaw, though too late, aimed at nothing leſs than the ſovereignty of the world. With this requeſt the king refuſed to comply; upon which his ſubjects, already provoked beyond meaſure at the taxes with which they were loaded, flew to arms, and ſurrounded the palace. The king had the good luck to eſcape their fury, and immediately leaving Alexandria, ſet ſail for Rome.

51
Is acknowledged by the Romans.

52
Is driven from the throne, and flies to Rome.

In his way to that city, he landed on the iſland of Rhodes, where the famous Cato at that time was, being on his way to Cyprus, to put the unjuſt decree of the ſenate in execution. Auletes, deſirous to confer with a man of his prudence, immediately ſent to acquaint him with his arrival. He imagined, that, upon this notice, Cato would immediately come and wait upon him; but the proud Roman told the meſſenger, that if the king of Egypt had any thing to ſay to Cato, he might, if he thought proper, come to his houſe. Accordingly the king went to pay him a viſit; but was received with very little ceremony by Cato, who did not even vouchſafe to riſe out of his ſeat when he came into his preſence. When Auletes had laid his affairs before this haughty republican, he was blamed by him for leaving Egypt, the richeſt kingdom in the world, in order to expoſe himſelf, as he ſaid, to the indignities he would meet with at Rome. There Cato told him, that nothing was in requeſt but wealth and grandeur. All the riches of Egypt, he ſaid, would not be ſufficient to ſatisfy the avarice of the leading men in Rome. He therefore adviſed him to return to Egypt; and ſtrive, by a more equitable conduct, to regain the affections of his people. He even offered to reconduct him thither, and employ his good offices in his behalf. But though Ptolemy was ſenſible of the propriety of this advice, the friends he had with him diſſuaded him from following it, and accordingly he ſet out for Rome.

53
Cato's
vice to

54
Infamo
conduc
Aulete

On his arrival in this metropolis, the king found, to his great concern, that Cæſar, in whom he placed his greateſt confidence, was then in Gaul. He was received, however, by Pompey with great kindneſs. He aſſigned him an apartment in his own houſe, and omitted nothing that lay in his power to ſerve him. But, notwithſtanding the protection of ſo powerful a man, Auletes was forced to go from houſe to houſe like a private perſon, ſoliciting the votes of the ſenators. After he had ſpent immenſe treaſures in procuring a ſtrong party in the city, he was at laſt permitted to lay his complaints before the ſenate; and at the ſame time there arrived an embaſſy from the Alexandrians, conſiſting of 100 citizens, to acquaint the ſenate with the reaſons of their revolt.

55
Berenic
raiſed t
throne
Egypt.

When Auletes firſt ſet out for Rome, the Alexandrians, not knowing what was become of him, placed on the throne his daughter Berenice; and ſent an embaſſy into Syria to Antiochus Aſiaticus, inviting him into Egypt to marry the queen, and reign in partnerſhip with her. Antiochus was dead before the arrival of the ambaſſadors; upon which the ſame propoſal was made to his brother Seleucus, who readily accepted it. This Seleucus is deſcribed by Strabo as monſtrouſly deformed in body, and ſtill more ſo in mind. The Egyptians nicknamed him *Cybioſactes*, or *the Scullion*; a name which ſeemed more fit for him than any other. He was ſcarce ſettled on the throne, when he gave a ſignal inſtance of his ſordid and avaricious temper. Ptolemy the firſt had cauſed the body of Alexander the Great to be depoſited in a coffin of maſſy gold. This the king ſeized upon; and by that means provoked his wife Berenice to ſuch a degree, that ſhe cauſed him to be murdered. She then married one Archelaus, high prieſt of Comana in Pontus, who pretended to be the ſon of Mithridates the Great; but was, in fact, only the ſon of that monarch's general.

56
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57
Marrie
Archela

Auletes was not a little alarmed on hearing of theſe tranſactions, eſpecially when the ambaſſadors arrived, who he feared would overturn all the ſchemes he had laboured ſo much to bring about. The embaſſy was headed by one Dion, a celebrated Academic philoſopher who

who had many powerful friends at Rome. But Ptolemy found means to get both him and moſt of his followers aſſaſſinated; and this intimidated the reſt to ſuch a degree, that they durſt not execute their commiſſion, or, for ſome time, even demand juſtice for the murder of their colleagues.

58
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ders the
ptian
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The report of ſo many murders, however, at laſt ſpread a general alarm. Auletes, ſure of the protection of Pompey, did not ſcruple to own himſelf the perpetrator of them. Nay, though an action was commenced againſt one Aſcitius, an aſſaſſin who had ſtabbed Dion the chief of the embaſſy above mentioned, and the crime was fully proved; yet he was acquitted by the venal judges, who had all been bribed by Ptolemy. In a ſhort time, the ſenate paſſed a decree, by which it was enacted, that the king of Egypt ſhould be reſtored by force of arms. All the great men in Rome were ambitious of this commiſſion; which, they well knew, would be attended with immenſe profit. Their conteſts on this occaſion took up a conſiderable time; and at laſt a prophecy of the Sybil was found out, which forbade the aſſiſting an Egyptian monarch with an army. Ptolemy, therefore, wearied out with ſo long a delay, retired from Rome, where he had made himſelf generally odious, to the temple of Diana at Epheſus, there to wait the deciſion of his fate. Here he remained a conſiderable time: but as he ſaw that the ſenate came to no reſolution, tho' he had ſolicited them by letters ſo to do; at laſt, by Pompey's advice, he applied to Gabinius the proconſul of Syria. This Gabinius was a man of a moſt infamous character, and ready to undertake any thing for money. Therefore, though it was contrary to an expreſs law for any governor to go out of his province without poſitive orders from the ſenate and people of Rome, yet Gabinius ventured to tranſgreſs this law, upon condition of being well paid for his pains. As a recompenſe for his trouble, however, he demanded 10,000 talents; that is, 1,937,500l. ſterling. Ptolemy, glad to be reſtored on any terms, agreed to pay the above mentioned ſum; but Gabinius would not ſtir till he had received one half of it. This obliged the king to borrow it from a Roman knight named *Caius Rabirius Poſthumius;* Pompey interpoſing his credit and authority for the payment of the capital and intereſt.

59
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he ſe-

60
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eſtore
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Gabinius now ſet out for Egypt, attended by the famous Mark Antony, who at this time ſerved in the army under him. He was met by Archelaus, who ſince the departure of Auletes had reigned in Egypt jointly with Berenice, at the head of a numerous army. The Egyptians were utterly defeated, and Archelaus taken priſoner in the firſt engagement. Thus Gabinius might have put an end to the war at once: but his avarice prompted him to diſmiſs Archelaus on his paying a conſiderable ranſom; after which, pretending that he had made his eſcape, freſh ſums were demanded from Ptolemy for defraying the expences of the war. For theſe ſums Ptolemy was again obliged to apply to Rabirius, who lent him what money he wanted at a very high intereſt. At laſt, however, Archelaus was defeated and killed, and thus Ptolemy again became maſter of all Egypt.

61
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l killed.

No ſooner was Auletes firmly ſettled on the throne, than he put to death his daughter Berenice, and oppreſſed his people with the moſt cruel exactions, in order to procure the money he had been obliged to borrow while in a ſtate of exile. Theſe oppreſſions and exactions the cowardly Egyptians bore with great patience, being intimidated by the garriſon which Gabinius had left in Alexandria. But neither the fear of the Romans, nor the authority of Ptolemy, could make them put up an affront offered to their religion. A Roman ſoldier happened to kill a cat, which was an animal held ſacred and even worſhipped by the Egyptians; and no ſooner was this ſuppoſed ſacrilege known, than the Alexandrians made a general inſurrection, and, gathering together in crowds, made their way through the Roman guards, dragged the ſoldier out of his houſe, and, in ſpite of all oppoſition, tore him in pieces.

62
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[illegible], and
the people
oppreſſed.

Notwithſtanding the heavy taxes, however, which Ptolemy laid on his people, it doth not appear that he had any deſign of paying his debts. Rabirius, who, as we have already obſerved, had ſent him immenſe ſums, finding that the king affected delays, took a voyage to Egypt, in order to expoſtulate with him in perſon. Ptolemy paid very little regard to his expoſtulations; but excuſed himſelf on account of the bad ſtate of his finances. For this reaſon he offered to make Rabirius collector general of his revenues, that he might in that employment pay himſelf. The unfortunate creditor accepted the employment for fear of loſing his debt. But Ptolemy, ſoon after, upon ſome frivolous pretence or other, cauſed him and all his ſervants to be cloſely confined. This baſe conduct exaſperated Pompey as much as Rabirius; for the former had been in a manner ſecurity for the debt, as the money had been lent at his requeſt, and the buſineſs tranſacted at a country houſe of his near Alba. However, as Rabirius had reaſon to fear the worſt, he took the firſt opportunity of making his eſcape, glad to get off with life from his cruel and faithleſs debtor. To complete his misfortunes, he was proſecuted at Rome as ſoon as he returned, 1. For having enabled Ptolemy to corrupt the ſenate with ſums lent him for that purpoſe. 2. For having debaſed and diſhonoured the character of a Roman knight, by farming the revenues, and becoming the ſervant of a foreign prince. 3. For having been an accomplice with Gabinius, and ſharing with him the 10,000 talents which that proconſul had received for his Egyptian expedition. By the eloquence of Cicero he was acquitted; and one of the beſt orations to be found in the writings of that author was compoſed on this occaſion. Gabinius was alſo proſecuted; and, as Cicero ſpoke againſt him, he very narrowly eſcaped death. He was, however, condemned to perpetual baniſhment, after having been ſtripped of all he was worth. He lived in exile till the time of the civil wars, when he was recalled by Cæſar, in whoſe ſervice he loſt his life.

63
Ingratitude
of Auletes

64
Leaves his
children to
the care of
the Romans.

Auletes enjoyed the throne of Egypt about four years after his re-eſtabliſhment; and at his death left his children, a ſon and two daughters, under the tuition of the Roman people. The name of the ſon was *Ptolemy*, thoſe of the daughters were *Cleopatra* and *Arſinoe*. This was the Cleopatra who afterwards became ſo famous, and had ſo great a ſhare in the civil wars of Rome. As the tranſactions of the preſent reign, however, are ſo cloſely connected with the affairs of Rome, that they cannot be well underſtood without knowing the ſituation of the Romans at that time, we refer for an account of them to the *Hiſtory of Rome*.

65
State of Egypt till its conqueſt by the caliph of Cairwan.

With Cleopatra ended the family of Ptolemy Lagus, the founder of the Grecian empire in Egypt, after it had held that country in ſubjection for the ſpace of 294 years. From this time Egypt became a province of the Roman empire, and continued ſubject to the emperors of Rome or Conſtantinople. In the year 642, it was conquered by the Arabs under Amru Ebn al As, one of the generals of the caliph Omar. In the year 889, an independent government was ſet up in this kingdom by Ahmed Ebn Tolun, who rebelled againſt Al Mokhadi caliph of Bagdad. It continued to be governed by him and his ſucceſſors for 27 years, when it was again reduced by Al Moctafi caliph of Bagdad. In about 30 years after, we find it again an independent ſtate, being joined with Syria under Mahomet Ebn Taj, who had been appointed governor of theſe provinces. This government, however, was alſo but ſhort lived; for in the year 968 it was conquered by Jawhar, one of the generals of Moez Ledinillah, the Fatemite caliph of Cairwan in Barbary. See Barbary, N° 34.

66
Moez takes poſſeſſion of his new kingdom.

No ſooner was Moez informed of the ſucceſs of his general, than he prepared with all expedition to go and take poſſeſſion of his new conqueſt. Accordingly he ordered all the vaſt quantities of gold which he and his predeceſſors had amaſſed, to be caſt into ingots of the ſize and figure of the millſtones uſed in hand mills, and conveyed on camels backs into Egypt. To ſhow that he was fully determined to abandon his dominions in Barbary, and to make Egypt the reſidence of himſelf and his ſucceſſors, he cauſed the remains of the three former princes of his race to be removed from Cairwan in Barbary, and to be depoſited in a ſtately moſque erected for that purpoſe in the city of Cairo in Egypt. This was a moſt effectual method to induce his ſucceſſors to reſide in Egypt alſo, as it was become an eſtabliſhed cuſtom and duty among thoſe princes frequently to pay their reſpectful viſits to the tombs of their anceſtors.

67
Will not ſuffer prayers to be ſaid for the caliph of Bagdad.

To eſtabliſh himſelf the more effectually in his new dominions, Moez ſuppreſſed the uſual prayers made in the moſques for the caliphs of Bagdad, and ſubſtituted his own name in their ſtead. This was complied with, not only in Egypt and Syria, but even throughout all Arabia, the city of Mecca alone excepted. The conſequence was, a ſchiſm in the Mahomedan faith, which continued upwards of 200 years, and was attended with continual anathemas, and ſometimes deſtructive wars between the caliphs of Bagdad and of Egypt.—Having fully eſtabliſhed himſelf in his kingdom, he died in the 45th year of his age, three years after he had left his dominions in Barbary; and was ſucceeded by his ſon Abu Al Manſur Barar, ſurnamed Aziz Billah.

68
Unſucceſsful expedition into Syria.

The new caliph ſucceeded to the throne at the age of 21; and committed the management of affairs entirely to the care of Jawhar, his father's long experienced general and prime miniſter. In 978, he ſent this famous warrior to drive out Al Aftekin, the emir of Damaſcus. The Egyptian general accordingly formed the ſiege of that place; but at the end of two months, was obliged to raiſe it, on the approach of an army of Karmatians under the command of Al Hakem. As Jawhar was not ſtrong enough to venture an engagement with theſe Karmatians, it was impoſſible for him to hinder them from effecting a junction with the forces of Al Aftekin. He therefore retreated, or rather fled, towards Egypt with the utmoſt expedition; but being overtaken by the two confederate armies, he was ſoon reduced to the laſt extremity. He was, however, permitted to reſume his march, on condition that he paſſed under Al Aftekin's ſword and Al Hakem's lance; and to this diſgraceful condition Jawhar found himſelf obliged to ſubmit. On his arrival in Egypt, he immediately adviſed Al Aziz to undertake an expedition in perſon into the eaſt, againſt the combined army of Turks, Karmatians, and Damaſcenes, under the command of Al Aftekin and Al Hakem. The caliph followed his advice; and advancing againſt his enemies, overthrew them with great ſlaughter. Al Aftekin himſelf eſcaped out of the battle; but was afterwards taken and brought to Al Aziz, who made him his chamberlain, and treated him with great kindneſs. Jawhar, in the mean time, was diſgraced on account of his bad ſucceſs; and in his diſgrace he continued till his death, which happened in the year of our Lord 990, and of the Hegira 381.

69
Aleppo b ſieged wit out ſucce

This year Al Aziz having received advice of the death of Saado'dawla prince of Aleppo, ſent a formidable army under the command of a general named *Manjubekin*, to reduce that place. Lulu, who had been appointed guardian to Saado'dawla's ſon, finding himſelf preſſed by the Egyptians, who carried on the ſiege with great vigour, demanded aſſiſtance from the Greek emperor. Accordingly, he ordered a body of troops to advance to Lulu's relief. Manjubekin, being informed of their approach, immediately raiſed the ſiege, and advanced to give them battle. An obſtinate engagement enſued, in which the Greeks were at laſt overthrown with great ſlaughter. After this victory, Manjubekin puſhed on the ſiege of Aleppo very briſkly; but finding the place capable of defending itſelf much longer than he at firſt imagined, and his proviſions beginning to fail, he raiſed the ſiege. The caliph upon this ſent him a very threatening letter, and commanded him to return before Aleppo. He did ſo; and continued the ſiege for 13 months; during all which time it was defended by Lulu with incredible bravery. At laſt, the Egyptians hearing that a numerous army of Greeks was on their way to relieve the city, they raiſed the ſiege, and fled with the utmoſt precipitation. The Greeks then took and plundered ſome of the cities which Al Aziz poſſeſſed in Syria; and Manjubekin made the beſt of his way to Damaſcus, where he ſet up for himſelf. Al Aziz being informed of this revolt, marched in perſon againſt him with a conſiderable army; but being taken ill by the way, he expired, in the 21ſt year of his reign and 42d of his age.

Al Aziz was ſucceeded by his ſon Abu Al Manſur, ſurnamed Al Hakem; who, being only 11 years of age, was put under the tuition of a eunuch of approved integrity.

70
Strange madneſs the caliph Al Hake

This reign is remarkable for nothing ſo much as the ſtrange madneſs with which the caliph was ſeized in the latter part of it. This manifeſted itſelf firſt by his iſſuing many prepoſterous edicts; but at length grew to ſuch a height, that he fancied himſelf a god, and found no fewer than 16,000 perſons who owned him as ſuch. Theſe were moſtly the Dararians, a new ſect ſprung up about this time, who were ſo called from their chief, Mohammed Ebn Iſhmael, ſurnamed Darari. He is ſuppoſed to have inſpired the mad caliph with this impious notion; and, as Darari ſet up for a ſecond Moſes, he did not ſcruple to aſſert that Al Hakem was the great Creator of the univerſe. For this reaſon, a zealous Turk ſtabbed him in the caliph's chariot. His death was followed by a three days uproar in the city of Cairo; during which, Darari's houſe was pulled down, and many of his followers maſſacred. The ſect, however, did not expire with its author. He left behind him a diſciple named Hamza, who, being encouraged by the mad caliph, ſpread it far and wide thro' his dominions. This was quickly followed by an abrogation of all the Mahommedan faſts, feſtivals, and pilgrimages, the grand one to Mecca in particular; ſo that the zealous Mahometans were now greatly alarmed, as juſtly ſuppoſing that Al Hakem deſigned entirely to ſuppreſs the worſhip of the true God, and introduce his own in its place. From this apprehenſion, however, they were delivered by the death of the caliph; who was aſſaſſinated, by a contrivance of his own ſiſter, in the year 1020.

Al Hakem was ſucceeded by his ſon Al Thaher, who reigned 15 years; and left the throne to a ſon under ſeven years of age, named Al Moſtanſer Billah.— In the year 1041, a revolt happened in Syria; but Al Moſtanſer having ſent a powerful army into that country, under the command of one *Anuſhtekin*, he not only reduced the rebels, but conſiderably enlarged the Egyptian dominions in Syria.

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In 1054, a Turk named Al Baſſaſiri, having quarrelled with the vizir Al Kayem caliph of Bagdad, fled to Egypt, and put himſelf under the protection of Al Moſtanſer. The latter, imagining this would be a favourable opportunity for enlarging his dominions, and perhaps ſeizing on the city of Bagdad, ſupplied Baſſaſiri with money and troops. By this aſſiſtance, he was enabled to poſſeſs himſelf of Arabian Irak, and ravaged that province to the very gates of Bagdad. On this, Al Kayem wrote to Togrol Beg, or Tangrolipix, the Turkiſh ſultan, who poſſeſſed very extenſive dominions in the eaſt, to come to his aſſiſtance. The ſultan immediately complied with his requeſt, and ſoon arrived at Bagdad with a formidable army and 18 elephants. Of this Baſſaſiri gave notice to Al Moſtanſer, and entreated him to exert himſelf further for his ſupport againſt ſo powerful an enemy. This was accordingly done, but nothing worthy of notice happened till the year 1058. At this time Baſſaſiri having found means to excite Ibrahim the ſultan's brother to a revolt, Togrol Beg was obliged to employ all his force againſt him. This gave Baſſaſiri an opportunity of ſeizing on the city of Bagdad itſelf; and the unfortunate caliph, according to ſome, was taken priſoner, or, according to others, fled out of the city. Baſſaſiri, on his entry, cauſed Al Moſtanſer to be immediately proclaimed caliph in all quarters of the city. Al Kayem's vizir he cauſed to be led on a camel through the ſtreets of Bagdad, dreſſed in a woollen gown, with a high red bonnet, and a leathern collar about his neck, a man laſhing him all the way behind. Then being ſewed up in a bull's hide, with the horns placed over his head, and hung upon hooks, he was beaten without ceaſing till he died. The imperial palace was plundered, and the caliph himſelf detained a cloſe priſoner.

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74
The caliph reſtored.

This ſucceſs was but ſhort lived; for, in 1059, Togrol Beg defeated his brother Ibrahim, took him priſoner, and ſtrangled him with a bow ſtring. He then marched to Bagdad, which Baſſaſiri thought proper to abandon at his approach. Here the caliph Al Kayem was delivered up by Mahras, the governor of a city called *Haditha*, who had the charge of him. The caliph was immediately reſtored to his dignity; which Baſſaſiri no ſooner underſtood, than he again advanced towards the city. Againſt him Togrol Beg ſent a part of his army under ſome of his generals, while he himſelf followed with the reſt. A battle enſued, in which the army of Baſſaſiri was defeated, and he himſelf killed. His head was brought to Togrol Beg, who cauſed it to be carried on a pike through the ſtreets of Bagdad.

75
Decline of the Egyptian empire.

Thus the hopes of Al Moſtanſer were entirely fruſtrated; and from this period we may date the declenſion of the Egyptian empire under the caliphs. They had made themſelves maſters of almoſt all Syria; but no ſooner was Baſſaſiri's bad ſucceſs known, than the younger part of the citizens of Aleppo revolted, and ſet up Mahmud Azzo'dawla, who immediately laid ſiege to the citadel. Al Moſtanſer ſent a powerful army againſt him, which Azzo'dawla entirely defeated, and took the general himſelf priſoner; and ſoon after this, he made himſelf maſter both of the city and citadel, with all their dependencies. In his new dominions he behaved with the greateſt cruelty, deſtroying every thing with fire and ſword, and making frequent incurſions into the neighbouring provinces, which he treated in the ſame manner.

76
Terrible famine and plague.

This diſaſter was ſoon followed by others ſtill more terrible. In 1066, a famine raged over all Egypt and Syria, with ſuch fury, that dogs and cats were ſold for four or five Egyptian dinars each, and other proviſions in proportion. Multitudes of people died in Cairo for want of food. Nay, ſo great was the ſcarcity, that the vizir had but one ſervant left who was able to attend him to the caliph's palace, and to whom he gave the care of his horſe when he alighted at the gate. But, at his return, he was ſurpriſed to find that the horſe had been carried off, killed and eaten by the famiſhed people. Of this he complained to the caliph; who cauſed three of them who had carried off the horſe to be hanged. Next day, however, he was ſtill more ſurpriſed to hear, that all the fleſh had been picked off the bones of the three unhappy criminals, ſo that nothing but the ſkeletons were left. And to ſuch a degree of miſery were the inhabitants, not only in Cairo but through all Egypt, reduced, that the carcaſes of thoſe who died were ſold for food at a great price, inſtead of being buried. All this time the caliph ſhowed the greateſt kindneſs and beneficence towards his unhappy ſubjects; inſomuch that of 10,000 horſes, mules, and camels, which he had in his ſtables when the famine began, he had only three left when it was removed.

77
Invaded by the Turks.

The famine was followed by a plague; and this by an invaſion of the Turks under Abu Ali Al Haſan Naſerod'dawla, the very general who had been ſent againſt

gainſt the rebel Azzo'dawla and defeated by him. He began with beſieging the caliph in his own palace; and the unhappy prince, being in no condition to make reſiſtance, was obliged to buy himſelf off at the expence of every thing valuable that was left in his exhauſted capital and treaſury. This, however, did not hinder thoſe mercileſs plunderers from ravaging all the Lower Egypt from Cairo to Alexandria, and committing the moſt horrid cruelties through that whole tract.—This happened in the years 1067 and 1068; and in 1069 and 1070, there happened two other revolts in Syria: ſo that this country was now almoſt entirely loſt.

78 Jeruſalem taken.

In 1095 died the caliph Al Moſtanſer, having reigned 60 years; and was ſucceeded by his ſon Abul Kaſem, ſurnamed Al Moſtali. The moſt remarkable tranſaction of this prince's reign, was his taking the city of Jeruſalem from the Turks in 1098; but this ſucceſs was only of ſhort duration; for it was the ſame year taken by the cruſaders.

79 A revolution in the kingdom.

From this time to the year 1164, the Egyptian hiſtory affords little elſe than an account of the inteſtine broils and conteſts between the vizirs or prime miniſters, who were now become ſo powerful, that they had in a great meaſure ſtripped the caliphs of their civil power, and left them nothing but a ſhadow of ſpiritual dignity. Theſe conteſts at laſt gave occaſion to a revolution, by which the race of Fatemite caliphs was totally extinguiſhed. This revolution was accompliſhed in the following manner. One *Shawer*, having overcome all his competitors, became vizir to Al Aded, the eleventh caliph of Egypt. He had not been long in poſſeſſion of this office, when Al Dargam, an officer of rank, endeavoured to deprive him of it. Both parties quickly had recourſe to arms; and a battle enſued, in which Shawer was defeated, and obliged to fly to Nuroddin prince of Syria, by whom he was graciouſly received, and who promiſed to reinſtate him in his office of vizir. As an inducement to Nuroddin to aſſiſt him more powerfully, Shawer told him that the cruſaders had landed in Egypt, and made a conſiderable progreſs in the conqueſt of it. He promiſed alſo, that, in caſe he was reinſtated in his office, he would pay Nuroddin annually the third part of the revenues of Egypt; and would, beſides, defray the whole expence of the expedition.

As Nuroddin bore an implacable hatred to the Chriſtians, he readily undertook an expedition againſt them, for which he was to be ſo well paid. He therefore ſent an army into Egypt under the command of Shawer and a general named *Aſadoddin*. Dargam, in the mean time, had cut off ſo many generals whom he imagined favourable to Shawer's intereſt, that he thereby weakened the military force of the kingdom, and in a great meaſure deprived himſelf of the power of reſiſtance. He was therefore eaſily overthrown by Aſadoddin, and Shawer reinſtated in the office of vizir. The faithleſs miniſter, however, no ſooner ſaw himſelf firmly eſtabliſhed in his office, than he refuſed to fulfil his engagements to Nuroddin by paying the ſtipulated ſums. Upon this, Aſadoddin ſeized Peluſium and ſome other cities. Shawer then entered into an alliance with the cruſaders, and Aſadoddin was beſieged by their combined forces in Peluſium. Nuroddin, however, having invaded the Chriſtian dominions in Syria, and taken a ſtrong fortreſs called *Harem*, Shawer and his confederates thought proper to hearken to ſome terms of accommodation, and Aſadoddin was permitted to depart for Syria.

In the mean time, Nuroddin, having ſubdued the greateſt part of Syria and Meſopotamia, reſolved to make Shawer feel the weight of his reſentment on account of his perfidious conduct. He therefore ſent back Aſadoddin into Egypt with a ſufficient force, to compel Shawer to fulfil his engagements: but this the vizir took care to do before the arrival of Aſadoddin; and thus, for the preſent, avoided the danger. It was not long, however, before he gave Nuroddin freſh occaſion to ſend this general againſt him. That prince had now driven the cruſaders almoſt entirely out of Syria, but was greatly alarmed at their progreſs in Egypt; and conſequently offended at the alliance which Shawer had concluded with them, and which he ſtill perſiſted in obſerving. This treaty was alſo thought to be contrived on purpoſe to prevent Shawer from being able to fulfil his promiſe to Nuroddin, of ſending him annually a third of the revenues of Egypt. Nuroddin therefore again deſpatched Aſadoddin into Egypt, in the year 1166, with a ſufficient force, and attended by the famous Salahaddin, or Saladin, his own nephew. They entered the kingdom without oppoſition, and totally defeated Shawer and the cruſaders. They next made themſelves maſters of Alexandria; and, after that, overran all the Upper Egypt. Saladin was left with a conſiderable garriſon in Alexandria; but Aſadoddin was no ſooner gone, than the cruſaders laid ſiege to that city. This at laſt obliged Aſadoddin to return to its relief. The great loſſes he had ſuſtained in this expedition probably occaſioned his agreeing to a treaty with Shawer, by which he engaged to retire out of Egypt, upon being paid a ſum of money.

Aſadoddin was no ſooner gone, than Shawer entered into a freſh treaty with the Franks. By this new alliance he was to attack Nuroddin in his own dominions, as he was at that time engaged in quelling ſome revolters, which would effectually prevent his ſending any more forces into Egypt. This treaty ſo provoked the Syrian prince, that he reſolved to ſuſpend his other conqueſts for ſome time, and exert his whole ſtrength in the conqueſt of Egypt.

80 Conqueſt of the cr ſaders.

By this time the cruſaders had reduced Peluſium, and made a conſiderable progreſs in the kingdom, as well as in ſome other countries, through the diviſions which reigned among the Mahometan princes. In ſuch places as they conquered, they put almoſt every body to the ſword, Chriſtians as well as Mahometans; ſelling their priſoners for ſlaves, and giving up the towns to be plundered by the ſoldiers. From Peluſium they marched to Cairo; which was then in no poſture of defence, and in the utmoſt confuſion, by reaſon of the diviſions which reigned in it. Shawer, therefore, as ſoon as he heard of their approach, cauſed the ancient quarter called *Meſr* to be ſet on fire, and the inhabitants to retire into the other parts. He alſo prevailed upon the caliph to ſolicit the aſſiſtance of Nuroddin; which the latter was indeed pretty much inclined of himſelf to grant, as it gave him the faireſt opportunity he could have wiſhed for, both of driving the cruſaders out of Egypt, and of ſeizing the kingdom

Egypt. dom to himſelf. For this purpoſe he had already raiſed an army of 60,000 horſe under his general Aſadoddin; and, on the receipt of Al Aded's meſſage, gave them orders to ſet out immediately. The cruſaders were now arrived at Cairo; and had ſo cloſely beſieged that place, that neither Shawer nor the caliph knew any thing of the approach of the Moſlem army which was haſtening to their relief. The vizir, therefore, finding it impoſſible to hold out long againſt the enemy, had recourſe to his old ſubterfuge of treaties and high promiſes. He ſent the enemy 100,000 dinars, and promiſed them 900,000 more, if they would raiſe the ſiege; which they, dreading the approach of Aſadoddin, very readily accepted.

81 ey are ulſed by army of roddin nce of maſcus. The army of Nuroddin now approached the capital by haſty marches, and were everywhere received with the greateſt demonſtrations of joy. Aſadoddin, on his arrival at Cairo, was invited by Al Aden to the royal palace, where he was entertained in the moſt magnificent manner, and received ſeveral preſents; nor were Saladin and the other principal officers leſs magnificently treated. Shawer alſo, conſcious of his perfidious conduct, was no leſs aſſiduous in attending punctually upon him. But having invited the general and ſome others to an entertainment, he had formed a ſcheme of having them ſeized and murdered. The plot, however, being diſcovered, Shawer himſelf had his head cut off, and Aſadoddin was made vizir in his ſtead. He did not, however, long enjoy his new dignity; for he died two months and five days after his inſtalment, being ſucceeded in his office of vizir by his nephew Saladin. 82 din becomes vizir Egypt.

The new vizir was the youngeſt of all the grandees who aſpired to that office, but had already given ſome ſignal proofs of his valour and conduct. What determined the caliph to prefer him to all the reſt is not known; but it is certain that ſome of them were highly diſpleaſed with his promotion, and even publicly declared that they would not obey him. In order to gain theſe to his intereſt, therefore, Saladin found it neceſſary to diſtribute among them part of the vaſt treaſures left by his uncle; by which means he ſoon governed Egypt without controul, as had been cuſtomary with the vizirs for ſome time before. Soon after his being inſtalled into the office of vizir, he gave a total defeat to the negroes who guarded the royal palace, and had oppoſed his election; by which means, and a ſtrong garriſon he had placed in the caſtle of Cairo, his power became firmly eſtabliſhed. Though he had not the leaſt intention of continuing in his allegiance to Nuroddin, he did not think it prudent at firſt to declare himſelf. He ſent for his father, however, and the reſt of his family, who were in Nuroddin's dominions, in order, as he ſaid, to make them partakers of his grandeur and happineſs. Nuroddin did not think proper to deny this requeſt; though, being already jealous of the great power of Saladin, he inſiſted that his family ſhould conſider him only as one of his generals in Egypt.

A good underſtanding ſubſiſted between Nuroddin and Saladin for ſome time, which did not a little contribute to raiſe the credit of the latter with the Egyptians. In 1169, Nuroddin ſent him orders to omit the name of Al Aded, the caliph of Egypt, in the public prayers, and ſubſtitute that of the caliph of Bagdad in its place. This was at any rate a dangerous attempt [illegible] vour [illegible] Al A[illegible], or if it did not, it gave Sa[illegible] opportunity of engroſſing even that ſmall remnant of power which was left to the caliph. Al Aded, however, was not ſenſible of his diſgrace; for he was on his deathbed, and paſt recovery, when Nuroddin's orders were executed. After his death, Saladin ſeized on all his wealth and valuable effects; which conſiſted of jewels of prodigious ſize, ſumptuous furniture, a library containing 100,000 volumes, &c. His family he cauſed to be cloſely confined in the moſt private and retired part of the palace; and either manumitted his ſlaves, or kept them for himſelf, or diſpoſed of them to others. 83 Seizes the effects of the caliph.

Saladin was now arrived at the higheſt pitch of wealth, power, and grandeur. He was, however, obliged to behave with great circumſpection with regard to Nuroddin; who ſtill continued to treat him as his vaſſal, and would not ſuffer him to diſpute the leaſt of his commands. He relied for advice chiefly on his father Ayub; who was a conſummate politician, and very ambitious of ſeeing his ſon raiſed to the throne of Egypt. He therefore adviſed Saladin to continue ſtedfaſt in his reſolutions; and, whilſt he amuſed Nuroddin with feigned ſubmiſſions, to take every method in his power to ſecure himſelf in the poſſeſſion of ſo valuable a kingdom. Nuroddin himſelf, however, was too great a maſter in the art of diſſimulation to be eaſily impoſed on by others; and therefore, though he pretended to be well pleaſed with Saladin's conduct, he was all this time raiſing a powerful army, with which he was fully determined to invade Egypt the following year. But while he meditated this expedition, he was ſeized with a quinſy at the caſtle of Damaſcus, which put an end to his life, in the year 1173. 84 Aſpires to the crown.

Saladin, though now freed from the apprehenſions of ſuch a formidable enemy, dared not venture to aſſume the title of *Sovereign*, while he ſaw the ſucceſſor of Nuroddin at the head of a very powerful army, and no leſs deſirous than able to diſpoſſeſs him. For this reaſon his firſt care was to ſecure to himſelf an aſylum, in caſe he ſhould be obliged to leave Egypt altogether. For this purpoſe he choſe the kingdom of Nubia; but having deſpatched his brother Malek Turanſhah thither, at the head of a conſiderable army, the latter was ſo much ſtruck with the ſterility and deſolate appearance of the country, that he returned without attempting any thing. Saladin then ſent his brother into Arabia Felix, in order to ſubdue that country, which had been for ſome time held by Abdalnabi an Arabian prince. Malek entered the country without oppoſition; and having brought Abdalnabi to a general action, entirely defeated him, took him priſoner, and threw him into irons. He then overran and reduced under ſubjection to Saladin great part of the country, taking no fewer than 80 caſtles or fortreſſes of conſiderable ſtrength. 85 Subdues Arabia Felix.

After this good fortune, Saladin, now ſure of a convenient place of refuge in caſe of any misfortune, aſſumed the title of *Sultan* or ſovereign of Egypt; and was acknowledged as ſuch by the greater part of the ſtates. The zeal of the Egyptians for the Fatemite caliphs, however, ſoon produced a rebellion. One *Al Kanz*, or *Kanzanaddowla*, governor of a city in Upper Egypt, aſſembled a great army of blacks, or rather ſwarthy 86 Aſſumes the title of ſultan.

ſwarthy natives; and marching directly into the lower country, was there joined by great numbers of other Egyptians. Againſt them Saladin deſpatched his brother Malek, who ſoon defeated and entirely diſperſed them. This, however, did not prevent another inſurrection under an impoſtor, who pretended to be David the ſon of Al Aden the laſt Fatemite caliph, and had collected a body of 100,000 men. But before theſe had time to do any great damage, they were ſurpriſed by the ſultan's forces, and entirely defeated. Above 300 were publicly hanged, and a vaſt number periſhed in the field, inſomuch that it was thought ſcarce a fourth part of the whole body eſcaped.

About this time Saladin gained a conſiderable advantage over the cruſaders, commanded by William II. king of Sicily. That prince had invaded Egypt with a numerous fleet and army, with which he laid cloſe ſiege to Alexandria both by ſea and land. Saladin, however, marched to the relief of the city with ſuch ſurpriſing expedition, that the cruſaders were ſeized with a ſudden panic, and fled with the utmoſt precipitation, leaving all their military engines, ſtores, and baggage behind.

87
Saladin made ſovereign of Damaſcus.

In the year 1175, the inhabitants of Damaſcus begged of Saladin to accept the ſovereignty of that city and its dependencies; being jealous of the miniſter, who had the tuition of the reigning prince, and who governed all with an abſolute ſway. The application was no ſooner made, than the ſultan ſet out with the utmoſt celerity to Damaſcus, at the head of a choſen detachment of 700 horſe. Having ſettled his affairs in that city, he appointed his brother Saif Al Iſlam governor of it; and ſet out for Hems, to which he immediately laid ſiege. Having made himſelf maſter of this place, he then proceeded to Hamah. The city very ſoon ſurrendered, but the citadel held out for ſome time. Saladin pretended that he accepted the ſovereignty of Damaſcus and the other places he had conquered, only as deputy to Al Malek Al Saleh, the ſucceſſor of Nuroddin, and who was then under age; and that he was deſirous of ſending Azzoddin, who commanded in the citadel, with a letter to Aleppo, where the young prince reſided. This ſo pleaſed Azzoddin, that he took the oath of fidelity to Saladin, and immediately ſet out with the ſultan's letter. He had not, however, been long at Aleppo before he was by the miniſter's orders thrown into priſon; upon which his brother, who had been appointed governor of the citadel Hamah in his abſence, delivered it up to Saladin without further ceremony. The ſultan then marched to Aleppo, with a deſign to reduce it; but, being vigorouſly repulſed in ſeveral attacks, he was at laſt obliged to abandon the enterpriſe. At the ſame time, Kamſchlegin, Al Malek's miniſter or vizir, hired the chief of the Bataniſts, or Aſſaſſins*, to murder him. Several attempts were made in conſequence of this application; but all of them, happily for Saladin, miſcarried.

After raiſing the ſiege of Aleppo, Saladin returned to Hems, which place the cruſaders had inveſted. On his approach, however, they thought proper to retire; after which, the ſultan made himſelf maſter of the ſtrong caſtle belonging to that place, which before he had not been able to reduce. This was ſoon followed by the reduction of Baalbec: and theſe rapid conqueſts ſo alarmed the miniſters of Al Malek, that, entering into a combination with ſome of the neighbouring princes, they raiſed a formidable army, with which they deſigned to cruſh the ſultan at once. Saladin, fearing the event of a war, offered to cede Hems and Hamah to Al Malek, and govern Damaſcus only as his lieutenant: but theſe terms being rejected, a battle enſued; in which the allied army was utterly defeated, and the ſhattered remains of it ſhut up in the city of Aleppo. This produced a treaty, by which Saladin was left maſter of all Syria, excepting only the city of Aleppo and the territory belonging to it.

83
Defeats hi enemies.

89
Receives a terrible overthrow from the cruſaders.

In 1176 Saladin returned from the conqueſt of Syria, and made his triumphal entry into Cairo. Here, having reſted himſelf and his troops for ſome time, he began to encompaſs the city with a wall 29,000 cubits in length, but which he did not live to finiſh. Next year he led a very numerous army into Paleſtine againſt the cruſaders. But here his uſual good fortune failed him. His army was entirely defeated. Forty thouſand of his men were left dead on the field; and the reſt fled with ſo much precipitation, that, having no towns in the neighbourhood where they could ſhelter themſelves, they traverſed the vaſt deſert between Paleſtine and Egypt, and ſcarce ſtopped till they reached the capital itſelf. The greateſt part of the army by this means periſhed; and as no water was to be had in the deſert above mentioned, almoſt all the beaſts died of thirſt before the fugitives arrived on the confines of Egypt. Saladin himſelf ſeemed to have been greatly intimidated; for in a letter to his brother Al Malek, he told him, that "he was more than once in the moſt imminent danger; and that God, as he apprehended, had delivered him from thence, in order to reſerve him for the execution of ſome grand and important deſign."

In the year 1182, the ſultan ſet out on an expedition to Syria with a formidable army, amidſt the acclamations and good wiſhes of the people. He was, however, repulſed with loſs both before Aleppo and Al Mawſel, after having ſpent much time and labour in beſieging theſe two important places.

90
The Chriſtians receive a great defe at ſea.

In the mean time, a moſt powerful fleet of European ſhips appeared on the Red ſea, which threatened the cities of Mecca and Medina with the utmoſt danger. The news of this armament no ſooner reached Cairo, than Abu Becr, Saladin's brother, who had been left viceroy in the ſultan's abſence, cauſed another to be fitted out with all ſpeed under the command of Lulu, a brave and experienced officer, who quickly came up with them, and a dreadful engagement enſued. The Chriſtians were defeated after an obſtinate reſiſtance, and all the priſoners butchered in cold blood. This proved ſuch a terrible blow to the Europeans, that they never more ventured on a like attempt.

91
Saladin's rapid conqueſts.

In 1183, Saladin continued to extend his conqueſts. The city of Amida in Meſopotamia ſurrendered to him in eight days; after which, being provoked by ſome violences committed by the prince of Aleppo, he reſolved at all events to make himſelf maſter of that place. He was now attended with better ſucceſs than formerly; for as his army was very numerous, and he puſhed on the ſiege with the utmoſt vigour. Amadoddin the prince capitulated, upon condition of being allowed to poſſeſs certain cities in Meſopotamia which had

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* See *Aſſaſſin.*

had formerly belonged to him, and being ready to attend the ſultan on whatever expedition he pleaſed. After the conqueſt of Aleppo, Saladin took three other cities, and then marched againſt his old enemies the cruſaders. Having ſent out a party to reconnoitre the enemy, they fell in with a conſiderable detachment of Chriſtians; whom they eaſily defeated, taking about 100 priſoners, with the loſs of only a ſingle man on their ſide. The ſultan, animated by this firſt inſtance of ſucceſs, drew up his forces in order of battle, and advanced againſt the cruſaders, who had aſſembled their whole army at Sepphoris in Galilee. On viewing the ſultan's troops, however, and perceiving them to be greatly ſuperior in ſtrength to what they had at firſt apprehended, they thought proper to decline an engagement, nor could Saladin with all his ſkill force them to it. But though it was found impoſſible to bring the cruſaders to a deciſive engagement, Saladin found means to haraſs them greatly, and deſtroyed great numbers of their men. He carried off alſo many priſoners, diſmantled three of their ſtrongeſt cities, laid waſte their territories, and concluded the campaign with taking another ſtrong town.

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For three years Saladin continued to gain ground on the cruſaders, yet without any deciſive advantage; but in 1187, the fortune of war was remarkably unfavourable to them. The Chriſtians now found themſelves obliged to venture a battle, by reaſon of the cruel ravages committed in their territories by Saladin, and by reaſon of the encroachments he daily made on them. Both armies therefore being reſolved to exert their utmoſt efforts, a moſt fierce and bloody battle enſued. Night prevented victory from declaring on either ſide, and the fight was renewed with equal obſtinacy next day. The victory was ſtill left undecided; but the third day the ſultan's men finding themſelves ſurrounded by the enemy on all ſides but one, and there alſo hemmed in by the river Jordan, ſo that there was no room to fly, fought like men in deſpair, and at laſt gained a moſt complete victory. Vaſt numbers of the Chriſtians periſhed on the field. A large body found means to retire in ſafety to the top of a neighbouring hill covered with wood; but being ſurrounded by Saladin's troops, who ſet fire to the wood, they were all obliged to ſurrender at diſcretion. Some of them were butchered by their enemies as ſoon as they delivered themſelves into their hands, and others thrown into irons. Among the latter were the king of Jeruſalem himſelf, Arnold prince of Al Shawbec and Al Carac, the maſters of the Templars and Hoſpitalers, with almoſt the whole body of the latter. So great was the conſternation of the Chriſtians on this occaſion, that one of Saladin's men is ſaid to have taken 30 of them priſoners, and tied them together with the cord of his tent, to prevent them from making their eſcape. The maſters of the Templars and Hoſpitalers, with the knights acting under them, were no ſooner brought into Saladin's preſence, than he ordered them all to be cut in pieces. He called them *Aſſaſſins* or *Bataniſts*; and had been wont to pay 50 dinars for the head of every Templar or Hoſpitaler that was brought him. After the engagement, Saladin ſeated himſelf in a magnificent tent, placing the king of Jeruſalem on his right hand, and Arnold prince of Al Shawbec and Al Carac on his left. Then he drank to the former, who was at that time ready to expire with thirſt, and at the ſame time offered him a cup of ſnow water. This was thankfully received; and the king immediately drank to the prince of Al Carac, who ſat near him. But here Saladin interrupted him with ſome warmth: "I will not (ſays he) ſuffer this curſed rogue to drink; as that, according to the laudable and generous cuſtom of the Arabs, would ſecure to him his life." Then, turning towards the prince, he reproached him with having undertaken the expedition while in alliance with himſelf, with having intercepted an Egyptian caravan in the time of profound peace, and maſſacring the people of which it was compoſed, &c. Notwithſtanding all this, he told him, he would grant him his life, if he would embrace Mahometaniſm. This condition, however, was refuſed; and the ſultan, with one ſtroke of his ſcimitar, cut off the prince's head. This greatly terrified the king of Jeruſalem; but Saladin aſſured him he had nothing to fear, and that Arnold had brought on himſelf a violent death by his want of common honeſty.

93
His further conqueſts.

The cruſaders being thus totally defeated and diſperſed, Saladin next laid ſiege to Tiberias, which capitulated in a ſhort time. From thence he marched towards Acca or Ptolemais, which likewiſe ſurrendered after a ſhort ſiege. Here he found 4000 Mahometan priſoners in chains, whom he immediately releaſed. As the inhabitants enjoyed at preſent a very extenſive trade, the place being full of merchants, he found there not only vaſt ſums of money, but likewiſe a great variety of wares exceedingly valuable, all which he ſeized and applied to his own uſe. About the ſame time his brother Al Malec attacked and took a very ſtrong fortreſs in the neighbourhood; after which the ſultan divided his army into three bodies, that he might with the greater facility overrun the territories of the Chriſtians. Thus, in a very ſhort time, he made himſelf maſter of Neapolis, Cæſarea, Sepphoris, and other cities in the neighbourhood of Ptolemais, where his ſoldiers found only women and children, the men having been all killed or taken priſoners. His next conqueſt was Joppa, which was taken by ſtorm after a vigorous reſiſtance. Every thing being then ſettled, and a diſtribution made of the ſpoils and captives, Saladin marched in perſon againſt Tebrien, a ſtrong fortreſs in the neighbourhood of Sidon; which was taken by aſſault, after it had ſuſtained a ſiege of ſix days. No ſooner was he maſter of this place, than he ordered the fortreſs to be razed, and the garriſon put to the ſword. From Tebrien the victorious ſultan proceeded to Sidon itſelf; which, being deſerted by its prince. ſurrendered almoſt on the firſt ſummons. Berytus was next inveſted, and ſurrendered in ſeven days. Among the priſoners Saladin found in this place the prince of a territory called *Hobeil*, who by way of ranſomed delivered up his dominions to him, and was of conſequence releaſed. About the ſame time, a Chriſtian ſhip, in which was a nobleman of great courage and experience in war, arrived at the harbour of Ptolemais, not knowing that it was in the hands of Saladin. The governor might eaſily have ſecured the veſſel; but neglecting the opportunity, ſhe eſcaped to Tyre, where the above mentioned nobleman, together with the prince of Hobeil, contributed not a little to retrieve the affairs of the Chriſtians, and enable them to make a ſtand for four years after.

94 Jeruſalem taken. Saladin in the mean time went on with his conqueſts. Having made himſelf maſter of Aſcalon after a ſiege of 14 days, he next inveſted Jeruſalem. The garriſon was numerous, and made an obſtinate defence; but Saladin having at laſt made a breach in the walls by ſapping, the beſieged deſired to capitulate. This was at firſt refuſed: upon which the Chriſtian ambaſſador made the following ſpeech: "If that be the caſe, know, O ſultan, that we who are extremely numerous, and have been reſtrained from fighting like men in deſpair only by the hopes of an honourable capitulation, will kill all our wives and children, commit all our wealth and valuable effects to the flames, maſſacre 5000 priſoners now in our hands, leave not a ſingle beaſt of burden or animal of any kind belonging to us alive, and level with the ground the rock you eſteem ſacred, together with the temple Al Akſa. After this we will ſally out upon you in a body; and doubt not but we ſhall either cut to pieces a much greater number of you than we are, or force you to abandon the ſiege." This deſperate ſpeech had ſuch an effect upon Saladin, that he immediately called a council of war, at which all the general officers declared, that it would be moſt proper to allow the Chriſtians to depart unmoleſted. The ſultan therefore allowed them to march out freely and ſecurely with their wives, children, and effects; after which he received ten dinars from every man capable of paying that ſum, five from every woman, and two from every young perſon under age. For the poor who were not able to pay any thing, the reſt of the inhabitants raiſed the ſum of 30,000 dinars.

Moſt of the inhabitants of Jeruſalem were eſcorted by a detachment of Saladin's troops to Tyre; and ſoon after, he advanced with his army againſt that place. As the port was blocked up by a ſquadron of five men of war, Saladin imagined that he ſhould eaſily become maſter of it. But in this he found himſelf miſtaken. For, one morning by break of day, a Chriſtian fleet fell upon his ſquadron, and entirely defeated it; nor did a ſingle veſſel eſcape their purſuit. A conſiderable number of the Mahometans threw themſelves into the ſea during the engagement; moſt of whom were drowned, though ſome few eſcaped. About the ſame time Saladin himſelf was vigorouſly repulſed by land; ſo that, after calling a council of war, it was thought proper to raiſe the ſiege.

In 1188, Saladin, though his conqueſts were not ſo rapid and conſiderable as hitherto, continued ſtill ſuperior to his enemies. He reduced the city of Laodicea and ſome others, together with many ſtrong caſtles; but met alſo with ſeveral repulſes. At laſt he took the road to Antioch; and having reduced all the fortreſſes that lay in his way, many of which had been deemed impregnable, Bohemond prince of Antioch was ſo much intimidated, that he deſired a truce for ſeven or eight months. This Saladin found himſelf obliged to comply with, on account of the prodigious fatigues his men had ſuſtained, and becauſe his auxiliaries now demanded leave to return home.

95 Cruſaders retrieve their affairs. All theſe heavy loſſes of the Chriſtians, however, proved in ſome reſpects an advantage, as they were thus obliged to lay aſide their animoſities, which had originally proved the ruin of their affairs. Thoſe who had defended Jeruſalem, and moſt of the other fortreſſes taken by Saladin, having retreated to Tyre, formed there a very numerous body. This proved the means of preſerving that city, and alſo of re-eſtabliſhing their affairs for the preſent. For, having received powerful ſuccours from Europe, they were enabled in 1189 to take the field with 30,000 foot and 2000 horſe. Their firſt attempt was upon Alexandretta; from whence they diſlodged a ſtrong party of Mahometans, and made themſelves maſters of the place with very little loſs. They next laid ſiege to Ptolemais; of which Saladin had no ſooner received intelligence, than he marched to the relief of the place. After ſeveral ſkirmiſhes with various ſucceſs, a general engagement enſued, in which Saladin was defeated with the loſs of 10,000 men. This enabled the Chriſtians to carry on the ſiege of Ptolemais with greater vigour; which place, however, they were not able to reduce for the ſpace of two years.

This year the ſultan was greatly alarmed by an account that the emperor of Germany was advancing to Conſtantinople with an army of 260,000 men, in order to aſſiſt the other cruſaders. This prodigious armament, however, came to nothing. The multitude was ſo reduced with ſickneſs, famine, and fatigue, that ſcarce 1000 of them reached the camp before Ptolemais. The ſiege of that city was continued, though with bad ſucceſs on the part of the Chriſtians. They were repulſed in all their attacks, their engines were burnt with naphtha, and the beſieged always received ſupplies of proviſions in ſpite of the utmoſt efforts of the beſiegers; at the ſame time that a dreadful famine and peſtilence raged in the Chriſtian camp, which ſometimes carried off 200 people a-day.

96 Richar of Eng arrives Aſia. In 1191, the Chriſtians received powerful ſuccours from Europe. Philip II. of France, and Richard I. of England (from his great courage ſurnamed *Cœur de Lion*) arrived at the camp before Ptolemais. The latter was eſteemed the braveſt and moſt enterpriſing of all the generals the cruſaders had; and the ſpirits of his ſoldiers were greatly elated by the thoughts of acting under ſuch an experienced commander. Soon after his arrival, the Engliſh ſunk a Mahometan ſhip of vaſt ſize, having on board 650 ſoldiers, a great quantity of arms and proviſions, going from Berytus to Ptolemais. Of the ſoldiers and ſailors who navigated this veſſel, only a ſingle perſon eſcaped; who being taken priſoner by the Engliſh, was deſpatched to the ſultan with the news of the diſaſter. The beſieged ſtill defended themſelves with the greateſt reſolution; and the king of England happening to fall ſick, the operations of the beſiegers were conſiderably delayed. On his recovery, however, the attacks were renewed with ſuch fury, that the place was every moment in danger of being taken by aſſault. This induced them to ſend a letter to Saladin, informing him, that if they did not receive ſuccours the very next day, they would be obliged to ſubmit. As this town was the ſultan's principal magazine of arms, he was greatly affected with the account of their diſtreſs, eſpecially as he found it impoſſible to relieve them. The inhabitants, therefore, found themſelves under a neceſſity of ſurrendering the place. One of the terms of the capitulation was, that the cruſaders ſhould receive a very conſiderable ſum of money from Saladin, in conſe-

quence of their delivering up the Mahometan priſoners they had in their hands. This article Saladin refuſed to comply with; and, in conſequence of his refuſal, Richard cauſed 3000 of thoſe unfortunate men to be ſlaughtered at once.

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After the reduction of Ptolemais, the king of England, now made generaliſſimo of the cruſaders, took the road to Aſcalon, in order to beſiege that place; after which, he intended to make an attempt upon Jeruſalem itſelf. Saladin propoſed to intercept his paſſage, and placed himſelf in the way with an army of 300,000 men. On this occaſion was fought one of the greateſt battles of that age. Saladin was totally defeated, with the loſs of 40,000 men; and Aſcalon ſoon fell into the hands of the cruſaders. Other ſieges were afterwards carried on with ſucceſs, and Richard even approached within ſight of Jeruſalem, when he found, that, by reaſon of the weakened ſtate of his army, and the diviſions which prevailed among the officers who commanded it, he ſhould be under the neceſſity of concluding a truce with the ſultan. This was accordingly done in the year 1192; the term was, three years, three months, three weeks, three days, and three hours; ſoon after which the king of England ſet out on his return to his own dominions.

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In 1193 Saladin died, to the inexpreſſible grief of all true Mahometans, who held him in the utmoſt veneration. His dominions in Syria and Paleſtine were ſhared out among his children and relations into many petty principalities. His ſon Othman ſucceeded to the crown of Egypt: but as none of his ſucceſſors poſſeſſed the enterpriſing genius of Saladin, the hiſtory from that time till the year 1250 affords nothing remarkable. At this time the reigning ſultan Malek Al Salek was dethroned and ſlain by the *Mamelucs* or *Mamlouks*, as they are called, a kind of mercenary ſoldiers who ſerved under him. In conſequence of this revolution, the Mamelucs became maſters of Egypt, and choſe a ſultan from among themſelves.—Theſe Mamlouks are thought to have been young Turks or Tartars, ſold to private perſons by the merchants, from whom they were bought by the ſultan, educated at his expence, and employed to defend the maritime places of the kingdom. The reaſon of this inſtitution originally was, that the native Egyptians were become ſo cowardly, treacherous, and effeminate, from a long courſe of ſlavery, that they were unfit for arms. The Mamlouks, on the contrary, made moſt excellent ſoldiers; for having no friends but among their own corps, they turned all their thoughts to their own profeſſion. According to M. Volney, they came originally from Mount Caucaſus, and are diſtinguiſhed by the flaxen colour of their hair. Here they were found by the cruſaders, and were by them called *Mamelucs*, or more correctly *Mamlouks*. The expedition of the Tartars in in 1227 proved indirectly the means of introducing them into Egypt. Theſe horrible conquerors, having ſlaughtered and maſſacred till they were weary, brought along with them an immenſe number of ſlaves of both ſexes, with whom they filled all the markets in Aſia. The Turks, taking advantage of the opportunity, purchaſed about 12,000 young men, whom they bred up in the profeſſion of arms, in which they ſoon attained to great perfection; but becoming mutinous, like the Roman pretorian bands, they turned their arms againſt their maſters, and in 1250 depoſed and murdered the caliph, as has been already related.

100
Driven out by the Borgites.

The Mamlouks having got poſſeſſion of the government, and neither underſtanding nor putting a value upon any thing beſides the art of war, every ſpecies of learning decayed in Egypt, and a great degree of barbariſm was introduced. Neither was their empire of long duration notwithſtanding all their martial abilities. The reaſon of this was, that they were originally only a ſmall part of the ſultan of Egypt's ſtanding forces. As a numerous ſtanding army was neceſſary in a country where the fundamental maxim of government was, that every native muſt be a ſlave, they were at firſt at a loſs how to act; being juſtly ſuſpicious of all the reſt of the army. At laſt they reſolved to buy Chriſtian ſlaves, and educate them in the ſame way that they themſelves had formerly been. Theſe were commonly brought from Circaſſia, where the people, though they profeſſed Chriſtianity, made no ſcruple of ſelling their children. When they were completed in their military education, theſe ſoldiers were diſpoſed of through all the fortreſſes erected in the country to bridle the inhabitants; and becauſe in their language ſuch a fort was called *Borge*, the new militia obtained the name of *Borgites*. By this expedient the Mamlouks imagined they would be able to ſecure themſelves in the ſovereignty. But in this they were miſtaken. In proceſs of time, the old Mamlouks grew proud, inſolent, and lazy: and the Borgites, taking advantage of this, roſe upon their maſters, deprived them of the government, and transferred it to themſelves about the year 1382.

101
Egypt conquered by Selim.

The Borgites, as well as the former, aſſumed the name of *Mamlouks*; and were famous for their valour and ferocity of conduct. They were almoſt perpetually engaged in wars either foreign or domeſtic; and their dominion laſted till the year 1517, when they were invaded by Selim the Turkiſh ſultan. The Mamlouks defended themſelves with incredible valour; notwithſtanding which, being overpowered by numbers, they were defeated in every engagement. The ſame year, their capital, the city of Cairo, was taken, with a terrible ſlaughter of thoſe who defended it. The ſultan was forced to fly; and, having collected all his force, ventured a deciſive battle. The moſt romantic efforts of valour, however, were inſufficient to cope with the innumerable multitude which compoſed the Turkiſh army. Moſt of his men were cut in pieces, and the unhappy prince himſelf was at laſt obliged to take ſhelter in a marſh. He was dragged from his hiding-place, where he had ſtood up to the ſhoulders in water, and ſoon after put to death. With him ended the glory, and almoſt the exiſtence, of the Mamlouks, who were now everywhere ſearched for and cut in pieces.

This was the laſt great revolution in the Egyptian affairs: a revolution very little to the advantage of the natives, who may well doubt whether their ancient or modern conquerors have behaved with the greater degree of barbarity. Selim gave a ſpecimen of his government, the very day after his being put in full poſſeſſion of it, by the death of Tuman Bey the unfortunate ſultan above mentioned. Having ordered a theatre to be erected with a throne upon it on the banks of the

Nile, he cauſed all the priſoners, upwards of 30,000 in number, to be beheaded in his preſence, and their bodies thrown into the river.

102 His horrid cruelty.

Notwithſtanding this horrid cruelty of Selim, he did not attempt the total extermination of the race of Mamlouks, though this would have been quite agreeable to the maxims of Turkiſh policy; but in the preſent caſe he ſeems to have recollected, that if he eſtabliſhed a pacha in Egypt with the ſame powers with which he inveſted thoſe of other parts, he would be under ſtrong temptations to revolt by reaſon of the diſtance from the capital.

103 New form of government introduced by Selim.

He therefore propoſed a new form of government, by which the power being diſtributed among the different members of the ſtate, ſhould preſerve an equilibrium, ſo that the dependence of the whole ſhould be upon himſelf. With this view, he choſe from among the Mamlouks who had eſcaped the general maſſacre, a divan, or council of regency, conſiſting of the pacha and chiefs of the ſeven military corps. The former was to notify to this council the orders of the Porte, to ſend the tribute to Conſtantinople, and provide for the ſafety of government both external and internal; while, on the other hand, the members of the council had a right to reject the orders of the pacha, or even of depoſing him, provided they could aſſign ſufficient reaſons. All civil and political ordinances muſt alſo be ratified by them. Beſides this, he formed the whole body into a

104 His edict for a republic.

republic; for which purpoſe he iſſued an edict to the following purpoſe: "Though, by the help of the Almighty, we have conquered the whole kingdom of Egypt with our invincible armies; nevertheleſs our benevolence is willing to grant to the 24 ſangiacs (A) of Egypt a republican government, with the following conditions.

"I. That our ſovereignty ſhall be acknowledged by the republic; and in token of their obedience, our lieutenant ſhall be received as our repreſentative: but to do nothing againſt our will or the republic; but, on the contrary, ſhall co-operate with it for its welfare on all occaſions. Or if he ſhall attempt to infringe any of its privileges, the republic is at liberty to ſuſpend him from his authority, and to ſend to our Sublime Porte a complaint againſt him, &c.

"II. In time of war, the republic ſhall provide 12,000 troops at its own expence, to be commanded by a ſangiac or ſangiacs.

"III. The republic ſhall raiſe annually and ſend to our Sublime Porte the ſum of 560,000 aſlany (B), accompanied by a ſangiac, who ſhall have a ſatisfactory receipt, &c.

"IV. The ſame ſum to be raiſed for the uſe of Medina, and Kiabe or Mecca.

"V. No more troops of Janizaries ſhall be kept by the republic in time of peace than 14,000; but in time of war they may be increaſed to oppoſe our and the republic's enemies.

"VI. The republic ſhall ſend annually to our granary, out of the produce of the country, one million of caſiz (C) or meaſures of corn, viz, 600,000 of wheat and 400,000 of barley.

"VII. The republic, fulfilling theſe articles, ſhall have a free government over all the inhabitants of Egypt, independent of our lieutenant; but ſhall execute the laws of the country with the advice of the mollah or high prieſt under our authority and that of our ſucceſſors.

"VIII. The republic ſhall be in poſſeſſion of the mint as heretofore; but with this condition, that it ſhall be under the inſpection of our lieutenant, that the coin may not be adulterated.

"IX. That the republic ſhall elect a *ſheik bellet* out of the number of beys, to be confirmed by our lieutenant; and that the ſaid ſheik bellet ſhall be our repreſentative, and ſhall be eſteemed by all our lieutenants, and all our officers both of high and low rank, as the head of the republic; and if our lieutenant is guilty of oppreſſion, or exceeds the bounds of his authority, the ſaid ſheik bellet ſhall repreſent the grievances of the republic to our Sublime Porte: but in caſe any foreign enemy or enemies diſturb the peace of the republic, we and our ſucceſſors engage to protect it with our utmoſt power until peace is re-eſtabliſhed, without any coſt or expence to the republic.

"Given and ſigned by our *clemency* to the republic of Egypt."

105 The Tur iſh power now alm entirely loſt.

Thus the power of the Mamlouks ſtill continued in a very conſiderable degree, and by degrees increaſed ſo much as to threaten a total loſs of dominion to the Turks. During the laſt 50 years, the Porte having relaxed from its vigilance, ſuch a revolution has taken place, that the Turkiſh power is now almoſt reduced to nothing. But in order to underſtand this, we muſt conſider the way in which the race of Mamlouks is continued or multiplied in Egypt. This is not in the ordinary way, by marriage: on the contrary, M. Volney aſſures us, that "during 350 years in which there

106 Why the children the Mam louks and Turks all die in Egypt.

have been Mamlouks in Egypt, not one of them has left ſubſiſting iſſue; all their children periſh in the firſt or ſecond deſcent. Almoſt the ſame thing holds good with regard to the Turks; and it is obſerved, that they can only ſecure the continuance of their families by marrying women who are natives, which the Mamlouks have always diſdained. The means by which they are perpetuated and multiplied are the ſame by which they were firſt eſtabliſhed, viz. by ſlaves brought from their original country. From the time of the Moguls this commerce has been continued on the banks of the Cuban and Phaſis in the ſame manner as it is carried on in Africa, by the wars among the hoſtile tribes, and the miſery or avarice of the inhabitants, who ſell their children to ſtrangers. The ſlaves thus procured are firſt brought to Conſtantinople, and afterwards diſperſed through the empire, where they are purchaſed by the wealthy. When the Turks ſubdued Egypt (ſays M. Volney), they ſhould undoubtedly have prohibited this dangerous traffic; their omitting

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(A) Theſe ſangiacs are the governors of provinces.

(B) Each of theſe coins is in value about half a crown Engliſh; and the tribute ſince that time has been augmented to 800,000 aſlany, or about 100,000l. Sterling.

(C) Each caſiz weighs 25 occa, and each occa is equal to two pounds ten ounces Engliſh avoirdupois weight.

ting which ſeems about to diſpoſſeſs them of their conqueſt, and which ſeveral political errors have long been preparing.

“ For a conſiderable time the Porte had neglected the affairs of this province; and in order to reſtrain the pachas, had ſuffered the divan to extend its power till the chiefs of the janizaries and azabs were left without controul. The ſoldiers themſelves, become citizens by the marriages they had contracted, were no longer the creatures of Conſtantinople; and a change introduced into their diſcipline ſtill more increaſed theſe diſorders. At firſt the ſeven military corps had one common treaſury; and though the ſociety was rich, individuals, not having any thing at their own diſpoſal, could effect nothing. The chiefs, finding their power diminiſhed by this regulation, had intereſt enough to get it aboliſhed, and obtained permiſſion to poſſeſs diſtinct property, lands, and villages. And as theſe lands and villages depended on the Mamlouk governors, it was neceſſary to conciliate them to prevent their oppreſſions. From that moment the beys acquired an aſcendancy over the ſoldiers, who till then had treated them with diſdain; and this could not but continually increaſe, ſince their governments procured them conſiderable riches. Theſe they employed in creating themſelves friends and creatures. They multiplied their ſlaves; and after emancipating them, employed all their intereſt to promote them to various employments, and advance them in the army. Theſe upſtarts, retaining for their patrons the ſame ſuperſtitious veneration common in the Eaſt, formed factions implicitly devoted to their pleaſure.”

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Thus, about the year 1746, Ibrahim, one of the kiayas (D) of the janizaries, rendered himſelf in reality maſter of Egypt; having managed matters ſo well, that of the 24 beys or ſangiacs eight were of his houſehold. His influence too was augmented by always leaving vacancies in order to enjoy the emoluments himſelf; while the officers and ſoldiers of his corps were attached to his intereſt: and his power was completed by gaining over Rodoan, the moſt powerful of all the colonels, to his intereſt. Thus the pacha became altogether unable to oppoſe him, and the orders of the ſultan were leſs reſpected than thoſe of Ibrahim. On his death in 1757, his family, i. e. his enfranchiſed ſlaves, continued to rule in a deſpotic manner. Waging war, however, among each other, Rodoan, and ſeveral other chiefs were killed; until, in 1766, Ali Bey, who had been a principal actor in the diſturbances, overcame his enemies, and for ſome time rendered himſelf abſolute maſter of Egypt.

108
ory of
Bey.

Of this man there are various accounts. The following is that given by M. Volney. He begins with obſerving, that the private hiſtory of the Mamlouks in general muſt be ſubject to great uncertainty, by reaſon of their being generally carried off from their parents at a time of life when they can remember but little or nothing of their parents; and he remarks, that they are likewiſe unwilling to communicate the little they may happen to remember. It is moſt commonly ſuppoſed, however, that Ali Bey was born among the Abazans, a people of Mount Caucaſus; from whom, next to the Circaſſians, the ſlaves moſt valued by the Turks, and other nations who deal in that commodity are to be obtained.

109
He is bought and educated by Ibrahim Kiaya.

Having been brought to a public ſale at Cairo, Ali Bey was bought by two Jew brothers named Iſaac and Youſef, who made a preſent of him to Ibrahim Kiaya. At this time he is ſuppoſed to have been about 13 or 14 years old, and was employed by his patron in offices ſimilar to thoſe of the pages belonging to European princes. The uſual education was alſo given him; viz. that of learning to manage a horſe well; fire a carabine and piſtol; throw the djerid, a kind of dart uſed in the diverſions of that country, and which ſhall be afterwards deſcribed. He was alſo taught the exerciſe of the ſabre, and a little reading and writing. In all the feats of activity juſt mentioned, he diſcovered ſuch impetuoſity, that he obtained the ſurname of *Djendali*, or “madman;” and as he grew up, diſcovered an ambition proportionable to the activity diſplayed in his youth. About the age of 18 or 20, his patron gave him his freedom; the badge of which among the Turks is the letting the beard grow, for among that people it is thought proper only for women and ſlaves to want a beard. By his kind patron alſo he was promoted to the rank of kachef or governor of a diſtrict, and at laſt elected one of the 24 beys. By the death of Ibrahim in 1757, he had an oportunity of ſatisfying his ambition; and now engaged in every ſcheme for the promotion or diſgrace of the chiefs, and had a principal ſhare in the ruin of Rodoan Kiaya above mentioned. Rodoan's place was quickly filled by another, who did not long enjoy it; and in 1762 Ali Bey, then ſtyled *Sheik-el-Beled*, having got Abdelrahman, the poſſeſſor at that time, exiled, procured himſelf to be elected in his room.

110
He is baniſhed, but returns, and throws off the Turkiſh yoke,

However, he ſoon ſhared the fate of the reſt, being condemned to retire to Gaza. This place, being under the dominion of a Turkiſh pacha, was by no means agreeable; for which reaſon Ali having turned off to another place, kept himſelf concealed for ſome time, until in 1766 his friends at Cairo procured his recal. On this he appeared ſuddenly in that city; and in one night killed four of the beys who were inimical to his deſigns, baniſhed the reſt, and aſſumed the whole power to himſelf. Still, however, his ambition was not ſatisfied; and he determined on nothing leſs then to throw off his dependence on the Porte altogether, and become ſultan of Egypt. With this view he expelled the pacha, refuſed to pay the accuſtomed tribute, and in the year 1768 proceeded to coin money in his own name. The Porte being at that time on the eve of a dangerous war with Ruſſia, had not leiſure to attend to the proceedings of Ali Bey; ſo that the latter had an opportunity of going forward with his enterpriſes very vigorouſly.

111
Overcomes an Arabian prince,

His firſt expedition was againſt an Arabian prince named *Hammam*; againſt whom he ſent his favourite Mohammed Bey, under pretence that the former had concealed a treaſure intruſted with him by Ibrahim Kiaya, and that he afforded protection to rebels. Having deſtroyed this unfortunate prince, he next began to put in execution a plan propoſed to him

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(D) Theſe were the commanding officers of the janizaries, azabs, &c. who after the firſt year laid down their employments, and became veterans, with a voice in the divan.

112
Propoſes to make Mecca the emporium of Eaſt Indian commerce.

by a young Venetian merchant, of rendering Jedda, the port of Mecca, an emporium for all the commerce of India ; and even imagined he ſhould be able to make the Europeans abandon the paſſage to the Indies by the Cape of Good Hope. With this view, he fitted out ſome veſſels at Suez ; and manning them with Mamlouks, commanded the bey Haſſan to ſail with them to Jedda, and ſeize upon it, while a body of cavalry under Mohammed Bey advanced againſt the town. Both theſe commiſſions were executed according to his wiſh, and Ali became quite intoxicated with his ſucceſs. Nothing but ideas of conqueſt now occupied his mind, without conſidering the immenſe diſproportion between his own force and that of the grand ſignior. Circumſtances, it muſt be owned, were at that time very favourable to his ſchemes. The ſheik Daher was in rebellion againſt the Porte in Syria ; and the pacha of Damaſcus had ſo exaſperated the people by his extortions, that they were ready for a revolt.

113
His expedition into Syria.

Having therefore made the neceſſary preparations, Ali Bey deſpatched in 1770 about 500 Mamlouks to take poſſeſſion of Gaza, and thus ſecure an entrance into Paleſtine. Oſman, the pacha of Damaſcus, however, no ſooner heard of the invaſion than he prepared for war with the utmoſt diligence, while the troops of Ali Bey held themſelves in readineſs to fly on the firſt attack. They were relieved from their embarraſſment by Sheik Daher, who haſtened to their aſſiſtance, while Oſman fled without even offering to make the leaſt reſiſtance ; thus leaving the enemy maſters of all Paleſtine without ſtriking a ſtroke. About the end of February 1771, the grand army of Ali Bey arrived ; which, by the repreſentations made of it in Europe, was ſuppoſed to conſiſt of 60,000 men.

114
Volney's account of his army.

M. Volney, however, informs us, that this army was far from containing 60,000 ſoldiers ; though he allows that there might be two-thirds of that number, who were claſſed as follows : 1. Five thouſand Mamlouks, conſtituting the whole effective part of the army. 2. Fifteen hundred Arabs from Barbary on foot, conſtituting the whole infantry of the army. Beſides theſe, the ſervants of the Mamlouks, each of whom had two, would conſtitute a body of 10,000 men. A number of other ſervants would conſtitute a body of 2000 ; and the reſt of the number would be made up by ſutlers and other uſual attendants on armies. It was commanded by Mohammed Bey the friend of Ali. " But (ſays our author) as to order and diſcipline, theſe muſt not be mentioned. The armies of the Turks and Mamlouks are nothing but a confuſed multitude of horſemen, without uniforms, on horſes of all colours and ſizes, without either keeping their ranks or obſerving any regular order." This rabble took the road to Acre, leaving wherever they paſſed ſufficient marks of their rapacity and want of diſcipline. At Acre a junction was formed with the troops of Sheik Daher, conſiſting of 1500 Safadians (the name of Sheik Daher's ſubjects, from *Safad*, a village of Galilee, originally under his juriſdiction). Theſe were on horſeback, and accompanied by 1200 Motualis cavalry under the command of Sheik Naſif, and about 1000 Mogrebian infantry. Thus they proceeded towards Damaſcus, while Oſman prepared to oppoſe them by another army equally numerous and ill regulated : and M. Volney gives the following deſcription of their operations : " The reader muſt not here figure to himſelf a number of complicated and artificial movements : ſuch as thoſe which, within the laſt century, have reduced war with us to a ſcience of ſyſtem and calculation.

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The Aſiatics are unacquainted with the firſt elements of this conduct. Their armies are mere mobs, their marches ravages, their campaigns inroads, and their battles bloody frays. The ſtrongeſt or the moſt adventurous party goes in queſt of the other, which frequently flies without making any reſiſtance. If they ſtand their ground, they engage pell-mell, diſcharge their carabines, break their ſpears, and hack each other with their ſabres; for they have ſeldom any cannon, and when they have, they are but of little ſervice. A panic frequently diffuſes itſelf without cauſe ; one party flies, the other ſhouts victory ; the vanquiſhed ſubmit to the will of the conqueror, and the campaign often terminates without a battle.

" Such, in a great meaſure, were the military operations in Syria in the year 1771. The combined army of Ali Bey and Sheik Daher marched to Damaſcus. The pachas waited for them ; they approached, and, on the 6th of June, a deciſive action took place : the Mamlouks and Safadians ruſhed on the Turks with ſuch fury, that, terrified at their courage, they immediately took to flight, and the pachas were not the laſt in endeavouring to make their eſcape. The allies became maſters of the country, and took poſſeſſion of the city without oppoſition, there being neither walls nor ſoldiers to defend it. The caſtle alone reſiſted. Its ruined fortifications had not a ſingle cannon, much leſs gunners ; but it was ſurrounded by a muddy ditch, and behind the ruins were poſted a few muſketeers : and theſe alone were ſufficient to check this army of cavalry. As the beſieged, however, were already conquered by their fears, they capitulated the third day, and the place was to be ſurrendered next morning, when, at day-break, a moſt extraordinary revolution took place."

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This was no leſs than the defection of Mohammed Bey himſelf, whom Oſman had gained over in a conference during the night. At the moment, therefore, that the ſignal of ſurrender was expected, this treacherous general ſounded a retreat, and turned towards Egypt with all his cavalry, flying with as great precipitation as if he had been purſued by a ſuperior army. Mohammed continued his march with ſuch celerity, that the report of his arrival in Egypt reached Cairo only ſix hours before him. Thus Ali Bey found himſelf at once deprived of all his expectations of conqueſt ; and what was worſe, found a traitor whom he durſt not puniſh at the head of his forces. A ſudden reverſe of fortune now took place. Several veſſels laden with corn for Sheik Daher were taken by a Ruſſian privateer ; and Mohammed Bey, whom he deſigned to have put to death, not only made his eſcape, but was ſo well attended that he could not be attacked. His followers continuing daily to increaſe in number, Mohammed ſoon became ſufficiently ſtrong to march towards Cairo ; and, in the month of April 1772, having defeated the troops of Ali in a rencounter, entered the city ſword in hand, while the latter had ſcarce time to make his eſcape with 800 Mamlouks. With difficulty he was enabled to get to Syria by the aſſiſtance of Sheik Daher, whom he immediately joined with the troops

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troops he had with him. The Turks under Oſman were at that time beſieging Sidon, but raiſed the ſiege on the approach of the allied army, conſiſting of about 7000 cavalry. Though the Turkiſh army was at leaſt three times their number, the allies did not heſitate to attack them, and gained a complete victory. Their affairs now began to wear a more favourable aſpect; but the military operations were retarded by the ſiege of Yafa, a place which had revolted; and which, though defended only by a garden wall, without any ditch, held out for eight months. In the beginning of 1773 it capitulated, and Ali Bey began to think of returning to Cairo. For this purpoſe Sheik Daher had promiſed to furniſh him with ſuccours; and the Ruſſians, with whom he had now contracted an alliance, made him a promiſe of the like kind. Ali, however, ruined every thing by his own impatience. Deceived by an aſtrologer, who pretended that the auſpicious moment when he was highly favoured by the ſtars was juſt arrived, he would needs ſet out without waiting for the arrival of his allies. He was alſo farther deceived by a ſtratagem of Mohammed, who had by force extorted from the friends of Ali Bey letters preſſing his return to Cairo, where the people were weary of his ungrateful ſlave, and wanted only his preſence in order to expel him. Confiding in theſe promiſes, Ali Bey imprudently ſet out with his Mamlouks and 1500 Safadians given him by Daher; but had no ſooner entered the deſert which ſeparates Gaza from Egypt, than he was attacked by a body of 1000 choſen Mamlouks who were lying in wait for his arrival. They were commanded by a young bey, named *Mourad;* who being enamoured of the wife of Ali Bey, had obtained a promiſe of her from Mohammed, in caſe he could bring him her huſband's head. As ſoon as Mourad perceived the duſt by which the approach of Ali Bey's army was announced, he ruſhed upon him, attacked and took priſoner Ali Bey himſelf, after wounding him in the forehead with a ſabre. Being conducted to Mohammed Bey, the latter pretended to treat him with extraordinary reſpect, and ordered a magnificent tent to be erected for him; but in three days he was found dead of his wounds, as was given out; though ſome affirm, perhaps with equal reaſon, that he was poiſoned.

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After the death of Ali Bey, Mohammed Bey took upon him the ſupreme dignity; but this change of maſters proved of very little ſervice to the Egyptians. At firſt he pretended to be only the defender of the rights of the ſultan, remitted the uſual tribute to Conſtantinople, and took the cuſtomary oath of unlimited obedience; after which he ſolicited permiſſion to make war upon Sheik Daher, the ally of Ali Bey. The reaſon of this requeſt was a mere perſonal pique; and as ſoon as it was granted, he made the moſt diligent preparations for war. Having procured an extraordinary train of artillery, he provided foreign gunners, and gave the command of them to an Engliſhman named *Robinſon.* He brought from Suez a cannon 16 feet long, which had for a conſiderable time remained uſeleſs; and at length, in the month of February 1776, he appeared in Syria with an army equal in number to that which he had formerly commanded when in the ſervice of Ali Bey. Daher's forces, deſpairing of being able to cope with ſuch a formidable armament, abandoned Gaza, which Mohammed immediately took poſſeſſion of, and then marched towards a fortified town named Yafa. The hiſtory of this ſiege M. Volney gives as a ſpecimen of the Aſiatic manner of conducting operations of that kind. "Yafa (ſays he), the ancient Joppa, is ſituated on a part of the coaſt, the general level of which is very little above the ſea. The city is built on an eminence, in the form of a ſugar loaf, in height about 130 feet perpendicular. The houſes, diſtributed on the declivity, appear riſing above each other, like the ſteps of an amphitheatre. On the ſummit is a ſmall citadel, which commands the town; the bottom of the hill is ſurrounded by a wall without a rampart, of 12 or 14 feet high, and two or three in thickneſs. The battlements on the top are the only tokens by which it is diſtinguiſhed from a common garden wall. This wall, which has no ditch, is environed by gardens, where lemons, oranges, and citrons, grow in this light ſoil to a moſt prodigious ſize. The city was defended by five or ſix hundred Safadians and as many inhabitants, who, at the ſight of the enemy, armed themſelves with their ſabres and muſkets; they had likewiſe a few braſs canon, 24 pounders, without carriages; theſe they mounted as well as they could, on timbers prepared in a hurry; and ſupplying the place of experience by hatred and courage, they replied to the ſummons of the enemy with menaces and cannon ſhot.

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"Mohammed, finding he muſt have recourſe to force, formed his camp before the town; but was ſo little acquainted with the buſineſs in which he was engaged, that he advanced within half cannon ſhot. The bullets, which ſhowered upon the tents, apprizing him of his error, he retreated; and, by making a freſh experiment, was convinced he was ſtill too near. At length he diſcovered the proper diſtance, and ſet up his tent, in which the moſt extravagant luxury was diſplayed: around it, without any order, were pitched thoſe of the Mamlouks, while the Barbary Arabs formed huts with the trunks and branches of the orange and lemon trees, and the followers of the army arranged themſelves as they could: a few guards were diſtributed here and there; and, without making a ſingle entrenchment, they called themſelves encamped.

"Batteries were now to be erected, and a ſpot of riſing ground was made choice of to the ſouth-eaſtward of the town, where, behind ſome garden walls, eight pieces of canon were pointed, at 200 paces from the town; and the firing began, notwithſtanding the muſquetry of the enemy, who, from the tops of the terraces, killed ſeveral of the gunners.

"It is evident that a wall only three feet thick, and without a rampart, muſt ſoon have a large breach in it; and the queſtion was not how to mount, but how to get through it? The Mamlouks were for doing it on horſeback; but they were made to comprehend that this was impoſſible; and they conſented, for the firſt time, to march on foot. It muſt have been a curious ſight to ſee them, with their huge breeches of thick Venetian cloth, embarraſſed with their tucked-up *beniches*, their crooked ſabres in hand, and piſtols hanging to their ſides, advancing and tumbling among the ruins of the wall. They imagined that they had conquered every difficulty when this obſtacle was ſurmounted; but the beſieged, who formed a better judgment, waited till they arrived at the empty ſpace between the city and wall; where they aſſailed them from the terraces and windows of the houſes with ſuch a ſhower of bullets, that the Mamlouks did not ſo much as think of ſetting them on fire, but retired under a perſuaſion that the breach was utterly impracticable, ſince it was impoſſible to enter it on horſeback. Morad Bey brought them ſeveral times back to the charge, but in vain.

123
The town taken and the inhabitants maſſacred.

" Six weeks paſſed in this manner; and Mohammed was diſtracted with rage, anxiety, and deſpair. The beſieged however, whoſe numbers were diminiſhed by the repeated attacks, became weary of defending alone the cauſe of Daher. Some perſons began to treat with the enemy; and it was propoſed to abandon the place, on the Egyptians giving hoſtages. Conditions were agreed upon, and the treaty might be conſidered as concluded, when, in the midſt of the ſecurity occaſioned by this belief, ſome Mamlouks entered the town; numbers of others followed their example, and attempted to plunder. The inhabitants defended themſelves, and the attack recommenced: the whole army then ruſhed into the town, which ſuffered all the horrors of war; women and children, young and old men, were all cut to pieces, and Mohammed, equally mean and barbarous, cauſed a pyramid formed of the heads of theſe unfortunate ſufferers to be raiſed as a monument of his victory."

124
Death of Mohammed Bey.

By this diſaſter the greateſt terror and conſternation were everywhere diffuſed. Sheik Daher himſelf fled, and Mohammed ſoon became maſter of Acre alſo. Here he behaved with his uſual cruelty, and abandoned the city to be plundered by his ſoldiers. The French merchants claimed an exemption, and it was procured with the utmoſt difficulty: nor was even this likely to be of any conſequence; for Mohammed, informed that the treaſures of Ibrahim kiaya of Daher had been depoſited in that place, made an immediate demand of them, threatening every one of the merchants with death if the treaſures were not inſtantly produced. A day was appointed for making the ſearch; but before this came, the tyrant himſelf died of a malignant fever after two days illneſs. His death was no ſooner known than the army made a precipitate retreat, ſuch as has been already mentioned from Damaſcus. Sheik Daher continued his rebellion for ſome time, but was at laſt entirely defeated, and his head ſent to Conſtantinople by Haſſan Pacha the Turkiſh high-admiral.

125
Hiſtory of Egypt from that time to the year 1786.

The death of Mohammed was no ſooner known in Egypt, than Morad Bey haſtened to Cairo in order to diſpute the ſovereignty with Ibrahim Bey, who had been intruſted with the government on his departure from that place for Syria. Preparations for war were made on both ſides; but at laſt, both parties finding that the conteſt muſt be attended with great difficulty, as well as very uncertain in the event, thought proper to come to an accommodation, by which it was agreed that Ibrahim ſhould retain the title of Sheik El Beled, and the power was to be divided between them. But now the beys and others who had been promoted by Ali Bey, perceiving their own importance totally annihilated by this new faction, reſolved to ſhake off the yoke, and therefore united in a league under the title *of the Houſe of Ali Bey*. They conducted their matters with ſo much ſilence and dexterity, that both Morad and Ibrahim were obliged to abandon Cairo. In a ſhort time, however, they returned and defeated their enemies though three times their number; but notwithſtanding this ſucceſs, it was not in their power totally to ſuppreſs the party. This indeed was owing entirely to their unſkilfulneſs in the art of war, and their operations for ſome time were very trifling. At laſt, a new combination having been formed among the beys, five of them were ſentenced to baniſhment in the Delta. They pretended to comply with this order, but took the road of the deſert of the Pyramids, through which they were purſued for three days to no purpoſe. At laſt they arrived ſafe at *Miniah*, a village ſituated on the Nile, 40 leagues above Cairo. Here they took up their reſidence, and being maſters of the river, ſoon reduced Cairo to diſtreſs by intercepting its proviſions. Thus a new expedition became neceſſary, and Ibrahim took the command of it upon himſelf. In the month of October 1783 he ſet out with an army of 3000 cavalry; the two armies ſoon came in ſight of each other, but Ibrahim thought proper to terminate the affair by negotiation. This gave ſuch offence to Morad, who ſuſpected ſome plot againſt himſelf, that he left Cairo. A war betwixt the two rivals was now daily expected, and the armies continued for 25 days in ſight of each other, only ſeparated by the river. Negotiations took place; and the five exiled beys, finding themſelves abandoned by Morad, took to flight, but were purſued and brought back to Cairo. Peace ſeemed now to be re-eſtabliſhed; but the jealouſy of the two rivals producing new intrigues, Morad was once more obliged to quit Cairo in 1784. Forming his camp, however, directly at the gates of the city, he appeared ſo terrible to Ibrahim, that the latter thought proper in his turn to retire to the deſert, where he remained till March 1785. A new treaty then took place; by which the rivals agreed to ſhare the power between them, though there was certainly very little probability that ſuch a treaty would be long obſerved. Since that time we have no accounts of any remarkable tranſaction in Egypt; nor indeed can we reaſonably expect any thing of conſequence in a country where matters are managed, as M. Volney expreſſes himſelf, by a ſeries of " cabals, intrigues, treachery, and murders."

Of late Egypt has been viſited by ſeveral travellers, all of whom have publiſhed deſcriptions of the country, its productions, inhabitants, &c. The lateſt are M. Savary, M. Volney, the baron de Tott, and Mr Bruce; and from the accounts publiſhed by thoſe gentlemen the following geographical deſcription is principally compiled.

126
Account of the country.

This country is ſtill divided into two principal parts, called the *Upper* and *Lower Egypt*. According to M. Savary, the former is only a long narrow valley beginning at Sienna and terminating at Cairo. It is bounded by two chains of mountains running from north to ſouth, and taking their riſe from the laſt cataract of the Nile. On reaching the latitude of Cairo they ſeparate to the right and left; the one taking the direction of Mount Colzoum, the other terminating in ſome ſand banks near Alexandria; the former being compoſed of high and ſteep rocks, the latter of ſandy hillocks over a bed of calcareous ſtone. Beyond theſe mountains are deſerts bounded by the Red ſea on the eaſt, and on the weſt by other parts of Africa; having in the middle that long plain which, even where wideſt, is not more than nine leagues over. Here the Nile is confined in its courſe betwixt theſe inſuperable barriers, and during the time of its inundation overflows the country all the way to the foot of the mountains; and Mr Bruce obſerves that there is a gradual ſlope from the bed of the river to thoſe mountains on both ſides. The baron de Tott ſays, that the mountains four leagues from the Nile, and facing Cairo, "are only a ridge of rocks of about 40 or 50 feet high, which divide Egypt from the plains of Libya; which ridge accompanies the courſe of the river, at a greater or leſſer diſtance, and ſeems as if only intended to ſerve as a bank to the general inundation."

Lower Egypt, according to M. Savary, comprehends all the country between Cairo, the Mediterranean, the iſthmus of Suez and Libya. "This immenſe plain (ſays he) preſents on the borders of its parching ſands a ſtrip of lands cultivated along the canals of the river, and in the middle a triangular iſland to which the Greeks gave the name of *Delta*;" at the top of the angle of which the baron de Tott informs us the rocks of Libya and the coaſts of Arabia open and recede from each other towards the eaſt and weſt, parallel to the Mediterranean. This great extent of country, from the kingdom of Barca to Gaza, is either overflowed by the river, or capable of being ſo; which thus fertilizes in a high degree a tract of country ſeemingly devoted to perpetual barrenneſs on account of the want of rain and the heat of the climate.

27 According to the teſtimonies of both Mr Bruce and M. Volney, the coaſt of Egypt is ſo extremely low, that it cannot be diſcovered at ſea till the mariners come within a few leagues of it. In ancient times the ſailors pretended to know when they approached this country, by a kind of black mud brought up by their ſounding line from the bottom of the ſea; but this notion, though as old as the days of Herodotus, has been diſcovered to be a miſtake by Mr Bruce; who found the mud in queſtion to ariſe while the veſſel was oppoſite to the deſerts of Barca. All along the coaſt of Egypt a ſtrong current ſets to the eaſtward.

28 In former times Egypt was much celebrated for its fertility; and there is great reaſon to believe, that were the ſame pains beſtowed upon the cultivation of the ground, and the diſtribution of the waters of the Nile in a proper manner, the ſame fertility would ſtill be found to remain. The cauſe of decreaſe in the produce of Egypt we ſhall deſcribe in the words of M. Savary. "The canals," ſays he, ſpeaking of the Delta, "which uſed to convey fertility with their waters, are now filled. The earth no longer watered, and continually expoſed to the burning ardour of the ſun, is converted into a barren ſand. In thoſe places where formerly were ſeen rich fields and flouriſhing towns, on the Peluſiac, the Tarictic, and the Mendeſian branches, which all ſtrike out from the canal of Damietta, nothing is to be found at this day but a few miſerable hamlets, ſurrounded by date trees and by deſerts. Theſe once navigable canals are now no more than a vain reſemblance of what they were: they have no communication with the lake Menzall, but what is merely temporary, on the ſwelling of the Nile; they are dry the remainder of the year. By deepening them by removing the mud depoſited by the river ſince the Turks have made themſelves maſters of Egypt, the country they paſs through would be again fertilized, and the Delta recover a third of its greatneſs."

129 Savary's account of the formation of the Delta.

Concerning this iſland it has been the opinion of a great many, even from very ancient times, that it was produced by the mud brought down by the inundations of the Nile: and this opinion we find adopted in the ſtrongeſt manner by M. Savary. His account of the ſuppoſed riſe of the Delta, and indeed of the greateſt part of Egypt, is to the following purpoſe. In thoſe early ages where hiſtory has not fixed any epoch, a certain people deſcended from the mountains near the cataracts into the valley overflowed by the Nile, and which was then an uninhabitable moraſs overgrown with reeds and canes. In what manner, or from what motive, theſe people were induced to deſcend from their ancient habitations to ſuch a place, or how they found means to penetrate into a moraſs which he expreſsly tells us was *impenetrable*, we are not informed, neither is it to our preſent purpoſe to inquire. At that time, however, the ſea bathed the feet of thoſe mountains where the pyramids are built, and advanced far into Libya. It covered alſo part of the iſthmus of Suez, and every part of what we now call the Delta formed a great gulf. After many ages the Egyptians, by what means is unknown, at leaſt not ſpecified by our author (though they ought to have been ſo, as the country it ſeems was then overflowed not only by the river but by the ocean), formed canals to carry off the ſtagnant waters of the Nile; oppoſed ſtrong dykes to its ravages; and, tired of dwelling in the caverns of rocks, built towns and cities upon ſpots elevated either by nature or art. Already the river was kept within its bounds, the habitations of men were out of the reach of its inundations, and experience had taught the people to foreſee and announce them. One of the kings of Egypt undertook to change the courſe of the river. After running 150 leagues between the barriers already mentioned, meeting with an unſurmountable obſtacle to the right, it turned ſuddenly to the left; and taking its courſe to the ſouthward of Memphis, it ſpreads its waters through the ſands of Libya. The prince we ſpeak of cauſed a new bed to be dug for it to the eaſt of Memphis; and by means of a large dyke obliged it to return between the mountains, and diſcharge itſelf into the gulf that bathes the rock on which the caſtle of Cairo is built. The ancient bed of the river was ſtill to be ſeen in the time of Herodotus, and may even be traced at this day acroſs the deſerts, paſſing to the weſtward of the lakes of Natrum. The Arabs ſtill beſtow upon it the name of *Bahr Belama*, "or ſea without water," and it is now almoſt choked up. To the labours of this monarch Egypt is indebted for the Delta. A reflux of the ſea was occaſioned by the enormous weight of the waters of the Nile, which precipitated themſelves into the bottom of the gulf. Thus the ſands and mud carried along with them were collected into heaps; and thus the Delta, at firſt very inconſiderable, roſe out of the ſea of which it repelled the limits. It was a gift of the river, and it has ſince been defended from the attacks of the ocean by raiſing dykes around it. Five hundred years before the Trojan war, according to Herodotus,

rodotus, the Delta was in its infancy; eight cubits of water being then ſufficient to overflow it. Strabo tells us, that boats paſſed over it from one extremity to the other; and that its towns, built upon artificial eminences, reſembled the iſlands of the Egean ſea. At the time that Herodotus viſited this country 15 cubits were neceſſary to cover all the Lower Egypt; but the Nile then overflowed the country for the ſpace of two days journey to the right and left of the iſland. Under the Roman empire 16 cubits performed the ſame effect. When the Arabs came to have the dominion, 17 cubits were requiſite; and at this day 18 are neceſſary to produce a plentiful crop; but the inundation ſtops at Cairo and the neighbouring country, without being extended over the Lower Egypt. Sometimes, however, the Nile riſes to 22 cubits; and the cauſe of this phenomenon is the mud for ſo many years accumulated on the iſland. Here, in the ſpace of 3284 years, we ſee the Delta elevated 14 cubits. Our author wrote in 1777, and informs us that he twice made the tour of the iſland during the time of the inundation. "The river (ſays he) flowed in full ſtreams in the great branches of Roſetta and Damietta, as well as in thoſe which paſs through the interior part of the country; but it did not overflow the lands, except in the lower parts, where the dykes were pierced for the purpoſe of watering the plantations of rice. We muſt not, however, imagine, as ſeveral travellers pretend, that this iſland will continue to riſe, and that it will become unfruitful. As it owes its increaſe to the annual ſettling of the mud conveyed thither by the Nile, when it ceaſes to be overflowed it will no longer increaſe in height, for it is demonſtrated that culture is not ſufficient to raiſe land.

"It is natural to imagine that the Delta has increaſed in length as well as in height; and of this we may look upon the following fact to be a remarkable proof. Under the reign of Pſammiticus, the Mileſians, with 30 veſſels, landed at the mouth of the Bolbitine branch of the Nile, now called that of *Roſetta*, where they fortified themſelves. There they built a town called *Metelis*, the ſame as *Facüe*, which, in the Coptic vocabularies, has preſerved the name of *Meſſil*. This town, formerly a ſeaport, is now nine leagues diſtant from the ſea; all which ſpace the Delta has increaſed in length from the time of Pſammiticus to the preſent. Homer, in his Odyſſey, puts the following words in the mouth of Menelaus. 'In the ſtormy ſea which waſhes Egypt there is an iſland called *Pharos*. Its diſtance from the ſhore is ſuch, that a veſſel with a fair wind may make the paſſage in a day.' From the way in which he ſpeaks of this iſland in other places, alſo, we may ſuppoſe that the iſland of Pharos, in his time, was not leſs than 20 leagues diſtant from the Egyptian coaſt, though now it forms the port of Alexandria; and this ſentiment is confirmed by the moſt ancient writers.

"What prodigious changes great rivers occaſion on the ſurface of the globe! How they elevate, at their mouths, iſlands which become at length large portions of the continent! It is thus that the Nile has formed almoſt all the Lower Egypt, and created out of the waters the Delta, which is 90 leagues in circumference. It is thus that the Meander, conſtantly repelling the waves of the Mediterranean, and gradually filling up the gulf into which it falls, has placed in the middle of the land the town of Miletus, formerly a celebrated harbour. It is thus that the Tigris and the Euphrates, let looſe from the Armenian hills, and ſweeping with them in their courſe the ſands of Meſopotamia, are imperceptibly filling up the Perſian gulf."

130 Mr Bru reaſons the contrary op nion.

Theſe are the reaſons aſſigned by M. Sayary for thinking that the Delta, as well as the greateſt part of the Lower Egypt, had been produced by the Nile; but this opinion is violently conteſted by other late travellers, particularly Mr Bruce, who has given a pretty long diſſertation upon it, as well as many occaſional remarks through the courſe of his work. He begins with obſerving, 1. That the country of Egypt is entirely a valley bounded by rugged mountains; whence it might ſeem natural to imagine that the Nile, overflowing a country of this kind, would be more ready to waſh away the ſoil than to add to it. 2. It is obſerved by Dr Shaw, and the ſame is confirmed by our author, that there is a gentle ſlope from the middle of the valley to the foot of the mountains on each ſide; ſo that the middle, in which is the channel of the Nile, is really higher than any other part of the valley. Large trenches are cut acroſs the country from the channel of the river, and at right angles with it, to the foot of the mountains. 3. As the river ſwells, the canals become filled with water, which naturally deſcending to the foot of the mountains, runs out at the farther end, and overflows the adjacent level country. 4. When the water, having attained the loweſt ground, begins to ſtagnate, it does not acquire any motion by reaſon of the canal's being at right angles with the channel of the Nile, unleſs in the caſe of exceſſive rains in Ethiopia, when the water by its regurgitation again joins the ſtream. In this caſe, the motion of the current is communicated to the whole maſs of waters, and every thing is ſwept away by them into the ſea. 5. It has been the opinion of ſeveral authors, that there was a neceſſity for meaſuring the height of the inundation on account of the quantity of mud brought down annually by the waters, by which the landmarks were ſo covered, that the proprietors could not know their own grounds after the river ſubſided. But whatever might be the reaſon of this covering of the landmarks in ancient times, it is certain that the mud left by the Nile could not be ſo in the time of Herodotus, or during any period of time aſſigned by that hiſtorian; for he aſſigns only one foot of increaſe of ſoil throughout Egypt in an hundred years from the mud left by the river; the increaſe during one year, therefore, being only the hundredth part of a foot, could not cover any landmark whatever. Beſides, the Egyptian lands are at this day parted by huge blocks of granite, which frequently have gigantic heads at the ends of them; and theſe could not, at the rate mentioned by Herodotus, be covered in ſeveral thouſand years. 6. The Nile does not now bring down any great quantity of mud; and it is abſurd to ſuppoſe that it can at preſent bring down as much as it did ſoon after the creation, or the ages immediately ſucceeding the deluge. Throughout Abyſſinia, according to the teſtimony of our author, the channel of every torrent is now worn to the bare rock, and almoſt every rivulet runs in a hard ſtony bed, all the looſe earth being long ago waſhed away; ſo that an annual and equable increaſe of the earth from the ſediment of the waters is impoſſible. 7. Our author made a great number of trials of the water of the Nile during the time of its inundation in different places. At Baſboch, when juſt coming down from the cultivated parts of Abyſſinia, and before it enters Sennaar, the ſediment is compoſed of fat earth and ſand, and its quantity is exceedingly ſmall. At the junction of the Nile and Aſtaboras the quantity of ſediment is very little augmented; conſiſting ſtill of the ſame materials, but now moſtly ſand. At Syene the quantity of ſediment was almoſt nine times greater than before; but was now compoſed almoſt entirely of ſand, with a very ſmall quantity of black earth. The concluſion of our author's experiments, however, is different from what we ſhould have been led to expect from thoſe juſt mentioned. "The experiment at Roſetta (ſays he) was not ſo often repeated as the others: but the reſult was, that in the ſtrength of the inundation the ſediment conſiſted moſtly of ſand; and, towards the end, was much the greater part earth. I think theſe experiments concluſive, as neither the Nile coming freſh from Abyſſinia, nor the Atbara, though joined by the Mareb, likewiſe from the ſame country, brought any great quantity of ſoil from thence."

8. Our author goes on to obſerve, that had the Nile brought down the quantities of mud which it has been ſaid to do, it ought to have been moſt charged with it at Syene; as there it contained the whole that was to be conveyed by it into Egypt. Inſtead of this, however, the principal part of the ſediment at this place was ſand; and this is very naturally accounted for from the vaſt quantities of ſand taken up by the winds in the deſerts between Gooze and Syene. Here our traveller frequently ſaw vaſt pillars of this kind of ſand, which is ſo fine and light as to form an impalpable powder, traverſing the deſert in various directions. Many of theſe were driven upon the river; and when it became calm in the evening, fell down into it entirely; thus affording materials for the many ſandy iſlands to be met with in the Nile.

9. Mr Bruce adopts the opinion of thoſe who ſuppoſe that there has been a continual decreaſe of water ſince the creation of the world. In this caſe, therefore, if the land of Egypt had been continually increaſing in height while the water that was to cover it decreaſed; there muſt have been frequent famines on account of the want of a ſufficient inundation. But ſo far is this from being the caſe, that, according to the teſtimony of ſeveral Arabian MSS. there had not, when Mr Bruce was in Egypt, been one ſcarce ſeaſon from the lowneſs of the inundation for 34 years; though during the ſame ſpace they had three times experienced a famine by too great an abundance of water, which carried away the millet.

10. If there had been ſuch an increaſe of land as Herodotus and others ſuppoſe, it muſt now have been very perceptible in ſome of the moſt ancient public monuments. This, however, is by no means the caſe. The baſe of every obeliſk in Upper Egypt is to this day quite bare and viſible. Near Thebes there are ſtill extant two coloſſal ſtatues, plainly deſigned for nilometers, and which ought by this time to have been almoſt covered with earth; but notwithſtanding the length of time theſe have remained there, they are ſtill bare to the very baſe.

121
Opinions of various authors concerning the riſe of the Nile in ancient times.

The ſtrongeſt argument which the advocates for the increaſe of land of Egypt can make uſe of is, that the meaſures by which the quantity of inundation is determined are ſmaller now than in former times; and theſe ſmall meaſures are ſaid to have been introduced by the Saracens. On this Mr Bruce very juſtly obſerves, that ſuch an expedient could not have anſwered any good purpoſe; as no decreaſe of the meaſure could have augmented the quantity of corn produced by the ground. M. Savary obſerves, that, to render his calculation concerning the growth of land in Egypt abſolutely exact, it would be neceſſary to determine the preciſe length of the Greek, Roman, and Arabian cubit; and even to know the different alterations which that meaſure had undergone among theſe people: But this nicety he thinks needleſs; looking upon the general fact to be fully eſtabliſhed by what he had ſaid before. Mr Bruce, however, has treated the ſubject with much greater accuracy. He obſerves, that from the ſituation of Canopus, the diſtance betwixt Egypt and Cyprus, and the extenſion of the land to the northward, it appears that no addition of any conſequence has been made to it for 3000 years paſt. The only argument left for the increaſe of land therefore muſt be taken from the nilometer. The uſe of this inſtrument was to determine the quantity of inundation, that ſo it might be known whether the crop would be ſufficient to enable the people to pay the taxes exacted of them by the ſovereign or not. The firſt ſtep was to know what ſpace of ground was overflowed in a given number of years; and this being determined by menſuration, the next thing was to aſcertain the produce of the ground upon an average. Thus becoming acquainted with the greateſt and leaſt crops produced, together with the exact extent of ground overflowed, they were furniſhed with all the neceſſary principles for conſtructing a nilometer; and nothing now remained but to erect a pillar in a proper place, and divide it exactly into cubits. This was accordingly done; the pillar was firſt divided into cubits, and theſe again were ſubdivided into digits. The firſt diviſion of this kind was undoubtedly that mentioned in Scripture, and called the *cubit of a man;* being the length of the arm from the middle of the round bone in the elbow to the point of the middle finger; a meaſure ſtill in uſe among all rude nations. As no ſtandard could be found by which this meaſure might be exactly determined, authors have differed very much concerning the true length of the cubit when reduced to our feet and inches. Dr Arbuthnot reckons two cubits mentioned in Scripture; one of them containing one foot nine inches and $\frac{888}{1000}$ of an inch; the other one foot and $\frac{824}{1000}$ of a foot; but Mr Bruce is of opinion that both of theſe are too large. He found, by menſuration, the Egyptian cubit to be exactly one foot five inches and three-fifths of an inch; and Herodotus mentions, that in his time the cubit uſed for determining the increaſe of the Nile was the Samian cubit, about 18 of our inches. The latter alſo informs us, that in the time of Moeris, the minimum of increaſe was 8 cubits, at which time all Egypt below the city of Memphis was overflowed; but that in his time 16 or at leaſt 15 cubits were neceſſary to produce the ſame effect. But to this account Mr Bruce objects, that Herodotus could have no certain information concerning the nilometer, becauſe he himſelf ſays that the prieſts, who alone had acceſs to it, would tell him nothing of the matter. Herodotus alſo informs us, that in the time of Moeris, great lakes were dug to carry off the waters of the inundation; and this ſuperfluous quantity Mr Bruce ſuppoſes to have been conveyed into the deſert for the uſe of the Arabs, and that by ſuch a vaſt drain the riſe of the water on the nilometer would undoubtedly be diminiſhed. But even granting that there was ſuch a difference between the riſe of the water in the time of Moeris and in that of Herodotus, it does not appear that any thing like it has appeared ever ſince. Strabo, who travelled into Egypt 400 years after the time of Herodotus, found that eight cubits were then the minimum, as well as in the time of Moeris. From ſome paſſages in Strabo, however, it appears that it required a particular exertion of induſtry to cauſe this quantity of water produce a plentiful crop; but there is not the leaſt reaſon to ſuppoſe, that the very ſame induſtry was not neceſſary in the time of Moeris; ſo that ſtill there is not any increaſe of land indicated by the nilometer. About 100 years afterwards, when the emperor Adrian viſited Egypt, we are informed from unqueſtionable authority, that 16 cubits were the minimum when the people were able to pay their tribute; and in the fourth century, under the emperor Julian, 15 cubits were the ſtandard; both which accounts correſpond with that of Herodotus. Laſtly, Procopius, who lived in the time of Juſtinian, informs us, that 18 cubits were then requiſite for a minimum.

132 No increaſe of land in theſe ages can reaſonably be ſuppoſed;

From theſe accounts, ſo various and diſcordant, it is obvious that no certain concluſion can be drawn. It is not indeed eaſy to determine the reaſon of this difference in point of fact. The only conjecture we can offer is, that as it appears that by proper care a ſmaller quantity of water will anſwer the purpoſe of producing a plentiful crop, ſo it is not unreaſonable to ſuppoſe that at different periods the induſtry of the people has varied ſo much as to occaſion the diſagreement in queſtion. This would undoubtedly depend very much upon their governor; and indeed Strabo informs us that it was by the care of the governor Petronius, that ſuch a ſmall quantity of water was made to anſwer the purpoſe. The concluſion drawn by Mr Bruce from the whole of the accounts above related, is, that from them it is moſt probable that no increaſe of land has been indicated by the nilometer from the time of Moeris to that of Juſtinian.

133 nor in more modern times.

On the conqueſt of Egypt by the Saracens, their barbarous and ſtupid caliph deſtroyed the nilometer, cauſing another to be built in its ſtead, and afterwards fixed the ſtandard of paying tribute conſiderably below what it had uſually been. The Egyptians were thus kept in continual terror, and conſtantly watched the new nilometer to obſerve the gradual increaſe or decreaſe of the water. On this he ordered the new nilometer to be deſtroyed, and another to be conſtructed, and all acceſs to it to be denied to the people. Which prohibition is ſtill continued to Chriſtians; though our author found means to get over this obſtacle, and has given a figure of the inſtrument itſelf. That the people might not, however, be ſuppoſed to remain in total ignorance of their ſituation, he commanded a proclamation to be daily made concerning the height of the water, but in ſuch an unintelligible manner that nobody was made any wiſer; nor, according to our author, is the proclamation underſtood at this day. From his own obſervations, however, Mr Bruce concludes, that 15 cubits are now the minimum of inundation, and as this coincides with the accounts of it in the times of Herodotus and Adrian, he ſuppoſes with great probability, that the ſame quantity of water has been neceſſary to overflow this country from the earlieſt accounts to the preſent time.

134 M. Savary's opinio concerning the iſle of Pharos refuted by M Volney.

It now remains only to take notice of what is ſaid by M. Savary concerning the former diſtance of the iſland of Pharos from the land to which it is now joined. With regard to his other aſſertions concerning the city of Metelis having been once a ſea port, M. Volney proves that he has quoted Strabo unfairly, and conſequently no ſtreſs is to be laid upon them. The principal, indeed the only, evidence which therefore remains, is the paſſage already quoted from Homer, viz. that "the iſland of Pharos is as far diſtant from one of the mouths of the Nile as a veſſel can ſail in one day before the wind." "But (ſays M. Volney) when Homer ſpeaks of the diſtance of this iſland, he does not mean its diſtance from the ſhore oppoſite, as that traveller (M. Savary) has tranſlated him, but from the land of Egypt and the river Nile. In the ſecond place, by a day's ſail we muſt not underſtand that indefinite ſpace which the veſſels, or rather the boats, of the ancient Greeks, could paſs through in a day; but an accurate and determined meaſure of 540 ſtadia. This meaſure is aſcertained by Herodotus, and is the preciſe diſtance between Pharos and the Nile, allowing, with M. d'Anville, 27,000 toiſes to 540 ſtadia. It is therefore far from being proved, that the increaſe of the Delta or of the continent was ſo rapid as has been repreſented; and, if we were diſpoſed to maintain it, we ſhould ſtill have to explain how this ſhore, which has not gained half a league from the days of Alexander, ſhould have gained eleven in the far ſhorter period from the time of Menelaus to that conqueror. The utmoſt extent of the encroachment of this land upon the ſea, however, may be learned from the words of Herodotus; who informs us, that "the breadth of Egypt, along the ſea coaſt, from the gulf of Plinthine to the lake Serbonis near Mount Caſius, is 3600 ſtadia; and its length from the ſea to Heliopolis 1500 ſtadia." Allowing therefore the ſtadium of Herodotus to be between 50 and 51 French toiſes, the 1500 ſtadia juſt mentioned are equal to 76,000 toiſes; which, at the rate of 57,000 to a degree, gives one degree and near 20 minutes and a half. But from the aſtronomical obſervations of M. Niebuhr, who travelled for the king of Denmark in 1761, the difference of latitude between Heliopolis, now called *Matarea*, and the ſea, being one degree 29 minutes at Damietta, and one degree 24 minutes at Roſetta, there is a difference on one ſide of three minutes and a half, or a league and a half, encroachment; and eight minutes and a half, or three leagues and a half on the other."

Thus the diſpute concerning the augmentation of the land of Egypt by the Nile ſeems to be abſolutely decided; and the encroachments of it on the ſea ſo trifling, that we may juſtly doubt whether they exiſt, or whether we are not entirely to attribute the apparent differences to thoſe which certainly take place betwixt the ancient and modern menſuration. M. Volney gives a very particular deſcription of the face of the country; but takes notice of the inconveniences under which travellers labour in this country, by which it is rendered extremely difficult to to ſay any thing certain with regard to the nature of the ſoil or mineral productions. Theſe ariſe from the barbarity and ſuperſtition of the people, who imagine all the Europeans to be magicians and ſorcerers, who come by their magic art to diſcover the treaſures which the genii have concealed under the ruins. So deep rooted is this opinion, that no perſon dares walk alone in the fields, nor can he find any one willing to accompany him; by which means he is confined to the banks of the river, and it is only by comparing the accounts of various travellers that any ſatisfactory knowledge can be acquired.

35 ey's nt of ace of oun-

According to this author, the entrance into Egypt at Roſetta preſents a moſt delightful proſpect, by the perpetual verdure of the palm trees on each ſide, the orchards watered by the river, with orange, lemon, and other fruit trees, which grow there in vaſt abundance; and the ſame beautiful appearance is continued all the way to Cairo. As we proceed farther up the river, he ſays, that nothing can more reſemble the appearance of the country than the marſhes of the Lower Loire, or the plains of Flanders: inſtead, however, of the numerous trees and country houſes of the latter, we muſt imagine ſome thin woods of palms and ſcyamores, with a few villages of mud-walled cottages built on artificial mounds. All this part of Egypt is very low and flat, the declivity of the river being ſo gentle, that its waters do not flow at a greater rate than one league in an hour. Throughout the country nothing is to be ſeen but palm trees, ſingle or in clumps, which become more rare in proportion as you advance; with wretched villages compoſed of huts with mud walls, and a boundleſs plain, which at different ſeaſons is an ocean of freſh water, a miry moraſs, a verdant field, or a duſty deſert; and on every ſide an extenſive and foggy horizon, where the eye is wearied and diſguſted. At length, towards the junction of the two branches of the river, the mountains of Cairo are diſcovered on the eaſt; and to the ſouth-weſt three detached maſſes appear, which from their triangular form are known to be the pyramids. We now enter a valley which turns to the ſouthward, between two chains of parallel eminences. That to the eaſt, which extends to the Red ſea, merits the name of a mountain from its ſteepneſs and height, as well as that of a deſert from its naked and ſavage appearance. Its name in the Arabic language is *Mokattam*, or the *hewn mountain*. The weſtern is nothing but a ridge of rock covered with ſand, which has been very properly termed a *natural mound* or *cauſeway*. In ſhort, that the reader may at once form an idea of this country, let him imagine on one ſide a narrow ſea and rocks; on the other, immenſe plains of ſand; and in the middle, a river, flowing through a valley of 150 leagues in length and from three to ſeven wide, which at the diſtance of 30 leagues from the ſea ſeparates into two arms; the branches of which wander over a ſoil almoſt free from obſtacles, and void of declivity.

From comparing his own obſervations with thoſe of other travellers, our author concludes, that the baſis of all Egypt from *Aſcuan* (the ancient Syene) to the Mediterranean, is a continued bed of calcareous ſtone of whitiſh hue, and ſomewhat ſoft, containing the ſame kind of ſhells met with in the adjacent ſeas, and which forms the immenſe quarries extending from Sacuadi to Manſalout for the ſpace of more than 25 leagues, according to the teſtimony of Father Sicard.

136 Mr Bruce's account of the deſerts, marble mountains, &c.

Mr Bruce, however, gives us a much more particular account of the ſources from whence were derived the vaſt quantities of marble met with in the remains of ancient buildings in this country. Theſe he diſcovered during his journey from Kenne to Coſſeir on the Red ſea, before he took his expedition to Abyſſinia. He gives a moſt diſmal idea of the deſerts through which he paſſed. What houſes he met with were conſtructed, like thoſe M. Volney mentions, of clay, being no more than ſix feet in diameter, and about ten in height. The mountains were the moſt dreary and barren that can be imagined; and the heat of the ſun ſo great, that two ſticks rubbed together only for half a minute would take fire and flame. In theſe burning regions no living creature was to be met with, even the poiſonous ſerpents and ſcorpions not being able to find ſubſiſtence. The firſt animal he ſaw was a ſpecies of ants in a plain called *Hamra* from the purple colour of its ſand; and it was remarkable that theſe inſects were of the ſame colour with the ſand itſelf. No water was anywhere to be met with on the ſurface; though at a place called *Legeta* there were ſome draw-wells, the water of which was more bitter than ſoot itſelf. At Hamra the porphyry mountains and quarries begin, the ſtone of which is at firſt ſoft and brittle; but the quantity is immenſe, as a whole day was taken up in paſſing by them. Theſe porphyry mountains begin in the latitude of nearly 24 degrees, and continue along the coaſt of the Red ſea to about 22° 30′, when they are ſucceeded by the marble mountains; theſe again by others of alabaſter, and theſe laſt by baſaltic mountains. From the marble mountains our author ſelected twelve kinds, of different colours, which he brought along with him. Some of the mountains appeared to be compoſed entirely of red and others of green marble, and by their different colours afforded an extraordinary ſpectacle. Not far from the porphyry mountains the cold was ſo great, that his camels died on his return from Abyſſinia, though the thermometer ſtood no lower than 42°.

Near to Coſſeir he diſcovered the quarries whence the ancients obtained thoſe immenſe quantities of marble with which they conſtructed ſo many wonderful works. The firſt place where the marks of their operations were very perceptible, was a mountain much higher than any they had yet paſſed, and where the ſtone was ſo hard that it did not even yield to the blows of a hammer. In this quarry he obſerved that ſome ducts or channels for conveying water terminated; which, according to him, ſhows that water was one of the means by which theſe hard ſtones were cut. In four days, during which our author travelled among theſe mountains, he ſays, that he had "paſſed more granite, porphyry, marble, and jaſper, than would build Rome, Athens, Corinth, Syracuſe, Memphis, Alexandria, and half a dozen ſuch cities." It appeared to him that the paſſages between the mountains and which he calls *defiles*, were not natural but artificial openings; where even whole mountains had been cut out, in order to preſerve a gentle ſlope towards the river. This deſcent our author ſuppoſes not to be above one foot in 50; ſo that the carriages muſt have gone very eaſily, and rather required ſomething to retard

tard their velocity than any force to pull them forward. Concerning the mountains in general, he obſerves, that the porphyry is very beautiful to the eye, and is diſcovered by a fine purple ſand without any gloſs. An unvariegated marble of a green colour is generally met with in the ſame mountain; and where the two meet, the marble becomes ſoft for a few inches, but the porphyry retains its hardneſs. The granite has a dirty brown appearance, being covered with ſand; but on removing this, it appears of a gray colour with black ſpots, with a reddiſh caſt all over it. The granite mountains lie nearer to the Red ſea, and ſeem to have afforded the materials for Pompey's pillar. The redneſs above mentioned ſeems to go off on expoſure to the air; but re-appears on working or poliſhing the ſtone farther. The red marble is next to the granite, though not met with in the ſame mountain. There is alſo a red kind with white veins, and vaſt quantities of the common green ſerpentine. Some ſamples of that beautiful marble named *Iſabella* were likewiſe obſerved; one of them of that yellowiſh caſt called *quaker colour*, the other of the bluiſh kind named *dove colour*. The moſt valuable kind is that named *verde antico*, which is found next to the Nile in the mountains of ſerpentine. It is covered by a kind of blue flaky ſtone, ſomewhat lighter than a ſlate, more beautiful than moſt kinds of marble, and when poliſhed having the appearance of a volcanic lava. In theſe quarries the verde antico had been uncovered in patches of about 20 feet ſquare. There were ſmall pieces of African marble ſcattered about in ſeveral places, but no rocks or mountains of it; ſo that our author conjectures it to lie in the heart of ſome other kind. The whole is ſituated on a ridge with a deſcent to the eaſt and weſt; by which means it might eaſily be conveyed either to the Nile, or Red ſea, while the hard gravel and level ground would readily allow the heavieſt carriages to be moved with very little force.

137
Of a ſuppoſed emerald mine.

Travellers have talked of an emerald mine in theſe deſerts; but from the reſearches of Mr Bruce, it does not appear to have any exiſtence. In the Red ſea indeed, in the latitude of 25° 3′, at a ſmall diſtance from the ſouth-weſtern coaſt, there is an iſland called the *Mountain of Emeralds*; but none of theſe precious ſtones are to be met with there. Here, as well as on the continent, there were found many pieces of a green pellucid ſubſtance; but veined, and much ſofter than rock cryſtal, though ſomewhat harder than glaſs. A few yards up the mountain he found three pits, which are ſuppoſed to have been the mines whence the ancients obtained the emeralds; but though many pieces of the green ſubſtance above mentioned were met with about theſe pits, no ſigns of the true emerald could be perceived. This ſubſtance, however, he conjectures to have been the *ſmaragdus* of the Romans. In the mountains of Coſſeir, as well as in ſome places of the deſerts of Nubia, our author found ſome rocks exactly reſembling petrified wood.

138
Stones of a curious appearance.

The only metal ſaid by the ancients to be produced in Egypt is copper. On the road to Suez are found great numbers of thoſe ſtones called *Egyptian flints* and *pebbles*, though the bottom is a hard, calcareous, and ſonorous ſtone. Here alſo M. Volney tells us, that the ſtones above mentioned, and which reſemble petrified wood, are to be met with. Theſe, he ſays, are in the form of ſmall logs cut ſlanting at the ends, and might eaſily be taken for petrifactions, though he is convinced that they are real minerals.

13
Salt la

F. Sicard mentions two lakes, from the water of which is produced annually a great quantity of ſalt containing much mineral alkali; and M. Volney informs us, that the whole ſoil of this country is impregnated with ſalt; ſo that, upon digging to ſome depth in the ground, we always meet with brackiſh water impregnated in ſome degree with the mineral alkali as well as with common ſalt. The two lakes mentioned by Sicard are ſituated in the deſert to the weſt of the Delta; and are three or four leagues in length, and about a quarter of a league in breadth, with a ſolid and ſtony bottom. For nine months in the year they are without water; but in the winter time there oozes out of the earth a reddiſh violet coloured water, which fills the lakes to the height of five or ſix feet. This being evaporated by the return of the heat, there remains a bed of ſalt two feet thick and very hard, which is broken in pieces with iron bars; and no leſs than 30,000 quintals are procured every year from theſe lakes. So great is the propenſity of the Egyptian ſoil to produce ſalt, that even when the gardens are overflowed for the ſake of watering them, the ſurface of the ground, after the evaporation and abſorption of the water, appears glazed over with ſalt. The water found in the wells contains mineral alkali, marine ſalt, and a little nitre.

14
Vegeta
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M. Volney is of opinion, that the fertile mould of Egypt, which is of a blackiſh colour, differs eſſentially from that of the other parts; and is derived from the internal parts of Ethiopia along with the waters of the Nile. This ſeems to contradict what he had before advanced againſt M. Savary concerning the increaſe of the land of Egypt by means of the waters of this river: but there is no reaſon at all to ſuppoſe this kind of earth to be of a foreign origin; it being always the reſult of vegetation and cultivation. Even the moſt barren and ſandy ſpots in the world, if properly watered, and ſuch vegetables planted in them as would grow there, in time would be covered with this black earth as well as others: and of this kind of artificial formation of ſoil, travellers give us a remarkable inſtance in the garden of the monks at Mount Sinai, where the country is naturally as barren as in any place of the world. "The monks of Sinai (ſays Dr Shaw), in a long proceſs of time, have covered over with dung and the ſweepings of their convent near four acres of naked rocks; which produce as good cabbage, roots, ſalad, and all kinds of pot herbs, as any ſoil and climate whatſoever. They have likewiſe raiſed olive, plum, almond, apple, and pear trees, not only in great numbers, but of excellent kinds. The pears particularly are of ſuch eſteem at Cairo, that there is a preſent of them ſent every year to the baſhaw and perſons of the firſt quality. Neither are their grapes inferior in ſize and flavour to any whatſoever: it being fully demonſtrated, by what this little garden produces, how far an indefatigable induſtry can prevail over nature; and that ſeveral places are capable of culture and improvement which were intended by nature to be barren, and which the lazy and ſlothful have always ſuffered to be ſo."

From this general account of the country, we may reaſonably conclude, that the natural fertility of Egypt.

41 ral ity of t not iſhed.

gypt is not diminiſhed in modern times, provided the ſame pains were taken in the cultivation of it as formerly; but this is not to be expected from the preſent degenerate race of inhabitants. "The Delta (ſays M. Savary) is at preſent in the moſt favourable ſtate for agriculture. Waſhed on the eaſt and weſt by two rivers formed by the diviſion of the Nile, each of which is as large and more deep than the Loire, interſected by innumerable rivulets; it preſents to the eye an immenſe garden, all the different compartments of which may be eaſily watered. During the three months that the Thebais is under water, the Delta poſſeſſes fields covered with rice, barley, vegetables, and winter fruits. It is alſo the only part of Egypt where the ſame field produces two crops of grain within the year, the one of rice, the other of barley."

42 od of ying ooling rater gypt.

The only cauſe of all this fertility is the Nile, without which the whole country would ſoon become an uninhabitable deſert, as rain falls very ſeldom in this part of the world. It flows with a very gentle ſtream through the flat country, and its waters are very muddy, ſo that they muſt have time to ſettle, or even require filtration before they can be drunk. For purifying the water, the Egyptians, according to M. Volney, uſe bitter almonds, with which they rub the veſſel containing it, and then the water becomes light and good; but on what principle this ingredient acts we cannot pretend to determine. Unglazed earthen veſſels filled with water are kept in every apartment; which by a continual evaporation through their porous ſubſtance, render the contained fluid very cool even in the greateſt heats *. The river continues muddy for ſix months: and during the three which immediately precede the inundation, the ſtream being reduced to an inconſiderable depth, becomes heated, green, fetid, and full of worms. The Egyptians in former times paid divine honours to the Nile, and ſtill hold it in great veneration. They believe its waters to be very nouriſhing, and that they are ſuperior to any in the world; an opinion very excuſable in them, as they have no other, and large draughts of cold water are among their higheſt luxuries.

43 e in- tion of Nile.

This river, ſwelled by the rains which fall in Abyſſinia, begins to riſe in Egypt about the month of May; but the increaſe is inconſiderable till towards the end of June, when it is proclaimed by a public crier through the ſtreets of Cairo. About this time it has uſually riſen five or ſix cubits; and when it has riſen to 16, great rejoicings are made, and the people cry out *Waſſah Allah*, that is, that God has given them abundance. This commonly takes place about the latter end of July, or at fartheſt before the 20th of Auguſt; and the ſooner it takes place, ſo much the greater are the hopes of a good crop. Sometimes, though rarely, the neceſſary increaſe does not take place till later. In the year 1705, it did not ſwell to 16 cubits till the 19th of September; the conſequence of which was that the country was depopulated by famine and peſtilence.

We may eaſily imagine that the Nile cannot overflow the whole country of itſelf in ſuch a manner as to render it fertile; for which reaſon there are innumerable canals cut from it acroſs the country, it has already been obſerved, by which the water is conveyed to diſtant places, and almoſt every town or village has one of theſe canals. In theſe parts of the country where the inundation does not reach, and where more water is required than it can furniſh, as for watering of gardens, they muſt have recourſe to artificial means for raiſing it from the river. In former times they made uſe of Archimedes's ſcrew *; but that is now diſuſed, and in place of it they have choſen the Perſian wheel. This is a large wheel turned by oxen, having a rope hung with ſeveral buckets which fill as it goes round, and empty themſelves into a ciſtern at the top. Where the banks of the river are high, they frequently make a baſon in the ſide of them, near which they fix an upright pole, and another with an axle acroſs the top of that, at one end of which they hang a great ſtone, and at the other a leathern bucket; this bucket being drawn down into the river by two men, is raiſed by the deſcent of the ſtone, and emptied into a ciſtern placed at a proper height. This kind of machine is uſed chiefly in the upper parts of the country, where the raiſing of water is more difficult than in places near the ſea. When any of their gardens or plantations want water, it is conveyed from the ciſterns into little trenches, and from thence conducted all round the beds in various rills, which the gardener eaſily ſtops by raiſing the mould againſt them with his foot, and diverts the current another way as he ſees occaſion.

144 Nilometer deſcribed.

The riſe of the inundation is meaſured, as has already been obſerved, by an inſtrument adapted for the purpoſe, and called *mikeas*, which we tranſlate *nilometer*. Mr Bruce informs us, that this is placed between Geeza and Cairo, on the point of an iſland named *Rhoda*, about the middle of the river, but ſomewhat nearer to Geeza. It is a round tower with an apartment, in the middle of which is a ciſtern neatly lined with marble. The bottom of this ciſtern reaches to that of the river, and there is a large opening by which the water has free acceſs to the inſide. The riſe of the water is indicated by an octagonal column of blue and white marble, on which are marked 20 peeks or cubits of 22 inches each. The two lowermoſt of theſe have no ſubdiviſions; but each of the reſt is divided into 24 parts called *digits*; the whole height of the pillar being 36 feet 8 inches.

145 Of the canals by which the water is conveyed &c.

When the river has attained its proper height, all the canals are opened, and the whole country laid under water. During the time of the inundation a certain vortical motion of the waters takes place: but notwithſtanding this, the Nile is ſo eaſily managed, that many fields lower than the ſurface of its waters are preſerved from injury merely by a dam of moiſtened earth not more than eight or ten inches in thickneſs. This method is made uſe of particularly in the Delta when it is threatened with a flood.

As the Nile does not always riſe to a height ſufficient for the purpoſes of agriculture, the former ſovereigns of Egypt were at vaſt pains to cut proper canals in order to ſupply the deficiency. Some of theſe are ſtill preſerved, but great numbers are rendered uſeleſs through the indolence or barbarity of their ſucceſſors. Thoſe which convey the water to Cairo, into the province of Fayoom, and to Alexandria, are beſt taken care of by government. The laſt is watched by an officer appointed for that purpoſe, whoſe office it is to hinder the Arabs of Bachria, who receive this ſuperfluous water, from turning it off before Alexandria be

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* *Eva-* r.

* See *Hydroſtatics*.

provided for, or opening it before the proper time, which would hinder the increaſe of the river. In like manner, that which conveys the water to Fayoom is watched, and cannot be opened before that of Cairo, which is called the *Canal of Trajan*. A number of other canals, only taken care of by thoſe who derive advantage from them, proceed from that arm of the Nile which runs to Damietta, and fertilize the province of Sharkia; which, making part of the iſthmus of Suez, is the moſt conſiderable of Egypt, and the moſt capable of a great increaſe of cultivation. The plains of Gaza which lie beyond, and are poſſeſſed by the Arabs, would be no leſs fertile, were it not for the exceſſive inclination theſe people have to deſtroy, ſo that they make war even with the ſpontaneous productions of the earth. A number of other canals run through the Delta; and the veſtiges of thoſe which watered the provinces to the eaſtward and weſtward, ſhow that in former times theſe were the beſt cultivated parts of Egypt. "We may alſo preſume (ſays the baron de Tott), from the extent of the ruins of Alexandria, the conſtruction of the canal, and the natural level of the lands which encompaſs the lake Mareotis, and extend themſelves weſtward to the kingdom of Barca, that this country, at preſent given up to the Arabs, and almoſt deſert, was once ſufficiently rich in productions of every kind to furniſh the city of Alexandria with its whole ſubſiſtence."

146
Air and climate of Egypt.

The air and climate of Egypt are extremely hot, not only from the height of the ſun, which in ſummer approaches to the zenith, but from the want of rain and from the vicinity of thoſe burning and ſandy deſerts which lie to the ſouthward. In the months of July and Auguſt, according to M. Volney, Reaumur's thermometer ſtands, even in the moſt temperate apartments, at the height of 24 or 25 degrees above the freezing point; and in the ſouthern parts it is ſaid to riſe ſtill higher. Hence, he ſays, only two ſeaſons ſhould be diſtinguiſhed in Egypt, the cool and the hot, or ſpring and ſummer. The latter continues for the greateſt part of the year, viz. from March to November or even longer; for by the end of February the ſun is intolerable to a European at nine o'clock in the morning. During the whole of this ſeaſon, the air ſeems to be inflamed, the ſky ſparkles, and every one ſweats profuſely, even without the leaſt exerciſe, and when covered with the lighteſt dreſs. This heat is tempered by the inundation of the Nile, the fall of the night dews, and the ſubſequent evaporation; ſo that ſome of the European merchants, as well as the natives, complain of the cold in winter. The dew we ſpeak of does not fall regularly throughout the ſummer, as with us; the parched ſtate of the country not affording a ſufficient quantity of vapour for this purpoſe. It is firſt obſerved about St John's day (June 24th), when the river has begun to ſwell, and conſequently a great quantity of water is raiſed from it by the heat of the ſun, which being ſoon condenſed by the cold of the night air, falls down in copious dews.

It might naturally be imagined, that as for three months in the year Egypt is in a wet and marſhy ſituation, the exceſſive evaporation and putrefaction of the ſtagnating waters would render it very unhealthy. But this is by no means the caſe. The great dryneſs of the air makes it abſorb vapours of all kinds with the utmoſt avidity; and theſe riſing to a great height, are carried off by the winds either to the ſouthward or northward, without having time to communicate any of their pernicious effects. This dryneſs is ſo remarkable in the internal parts of the country, that fleſh meat expoſed to the open air does not putrefy even in ſummer, but ſoon becomes hard and dry like wood. In the deſerts there are frequently dead carcaſes thus dried in ſuch a manner, and become ſo light, that one may eaſily lift that of a camel with one hand. In the maritime parts, however, this dryneſs of the air is not to be expected. They diſcover the ſame degree of moiſture which uſually attends ſuch ſituations. At Roſetta and Alexandria, iron cannot be expoſed to the air for 24 hours without ruſting. According to M. Volney, the air of Egypt is alſo ſtrongly impregnated with ſalts: for which opinion he gives the following reaſon: "The ſtones are corroded by natrum (mineral alkali), and in moiſt places long cryſtallizations of it are to be found, which might be taken for ſaltpetre. The wall of the Jeſuits garden at Cairo, built with earth and bricks, is everywhere covered with a cruſt of this natrum as thick as a crown piece: and when this garden has been overflowed by the waters of the kalidj (canal), the ground, after they have drained off, appears ſparkling on every ſide with cryſtals, which certainly were not brought thither by the water, as it ſhows no ſign of ſalt either to the taſte or by diſtillation."—But whatever may be the quantity of ſalt contained in the earth, it is certain that M. Volney's opinion of its coming thither from the air cannot be juſt. The ſalt in queſtion is exceſſively fixed, and cannot be diſſipated into the air without the violent heat of a glaſshouſe furnace; and even after this has been done, it will not remain diffuſed through the atmoſphere, but quickly falls back again. No experiments have ever ſhown that any ſalt was or could be diffuſed in the air, except volatile alkali, and this is now known to be formed by the union of two permanently elaſtic fluids; and it is certain that a ſaline air would quickly prove fatal to the animals who breathed it. The abundance of this kind of ſalt in Egypt therefore only ſhows, that by ſome unknown operation the heat of the ſun forms it from the two ingredients of earth and water, though we do not yet underſtand the manner, nor are able to imitate this natural operation.

147
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To this ſaline property of the earth M. Volney aſcribes the exceſſive quickneſs of vegetation in Egypt, which is ſo great, that a ſpecies of gourd called *kara* will, in 24 hours, ſend forth ſhoots of four inches in length; but for the ſame reaſon, in all probability, it is that no exotic plant will thrive in Egypt. The merchants are obliged annually to ſend to Malta for their garden ſeeds; for though the plants thrive very well at firſt, yet if the ſeed of them is preſerved, and ſown a ſecond year, they always come up too tall and ſlender.

By reaſon of the great dryneſs of the air, Egypt is exempted from the phenomena of rain, hail, ſnow, thunder, and lightning. Eartquakes are alſo ſeldom heard of in this country; though ſometimes they have been very fatal and deſtructive, particularly one in the year 1112. In the Delta, it never rains in ſummer, 148 ſe of dews in pt.

ſummer, and very ſeldom at any other time. In 1761, however, ſuch a quantity of rain unexpectedly fell, that a great number of houſes, built with mud-walls, tumbled entirely down by being ſoaked with the water, to which they were unaccuſtomed. In the Higher Egypt the rain is ſtill leſs frequent; but the people, ſenſible of the advantages which accrue from it, always rejoice when any falls, however inſufficient to anſwer the purpoſe. This deficiency of rain is ſupplied by the inundation and dews already mentioned. The latter proceed, as has already been ſaid, partly from the waters of the inundation and partly from the ſea. At Alexandria, after ſunſet, in the month of April, the clothes expoſed to the air and the terraces are ſoaked with them as if it had rained. Theſe dews are more or leſs copious according to the direction of the wind. They are produced in the greateſt quantity by the weſterly and northerly winds, which blow from the ſea; but the ſouth and ſouth-eaſt winds, blowing over the deſerts of Africa and Arabia, produce none.

149 nark regu- ty of the ds.

The periodical return of winds from a certain quarter is a very remarkable phenomenon in this country. When the ſun approaches the tropic of Cancer, they ſhift from the eaſt to the north; and, during the month of June, they always blow from the north or north-weſt. They continue northerly all the month of July, varying only ſometimes towards the eaſt, and ſometimes the contrary way. About the end of this month, and during the whole of Auguſt and September, they blow directly from the north, and are but of a moderate ſtrength, though ſomewhat weaker in the night than in the day. Towards the end of September they return to the eaſt, though they do not abſolutely fix on that point, but blow more regularly from it than any other except the north. As the ſun approaches the ſouthern tropic, they become more variable and tempeſtuous, blowing moſt commonly from the north, north-eaſt, and weſt, which they continue to do throughout the months of December, January, and February; and, during that ſeaſon, the vapours raiſed from the Mediterranean condenſe into miſt, or even ſometimes into rain. Towards the end of February, and in the ſucceeding month, they more frequently blow from the ſouth than from any other quarter. During ſome part of the month of March and in that of April, they blow from the ſouth, ſouth-eaſt, and ſouth-weſt; ſometimes from the north and eaſt, the latter becoming moſt prevalent about the end of that month, and continuing during the whole of May.

150 ns in yſſinia in Ar- ia oc- oned by oppo- currents ir.

It is to the long continuance of the north winds, formerly called the *Eteſians winds*, that Egypt probably owes its extreme dryneſs, as well as part of the inundation by which it is fertilized. From the month of April to July, there appear to be two immenſe currents in the atmoſphere, the under one blowing from the north, and the upper from the ſouth. By the former the vapours are raiſed from the Mediterranean and ſouthern parts of Europe, where they are carried over Abyſſinia, diſſolving there in immenſe deluges of rain; while by the latter the ſuperfluous vapours, or thoſe raiſed from the country of Abyſſinia itſelf, are carried northward toward the ſources of the Euphrates. Here the clouds coming from the ſouth, deſcending into the lower part of the atmoſphere, diſſolve in like manner into rain, and produce an inundation of the Euphrates ſimilar to that of the Nile, and immediately ſucceeding it. Mr Bruce had an opportunity of aſcertaining this fact in the month of June 1768; for at that time, while on a voyage from Sidon to Alexandria, he obſerved great numbers of thin white clouds moving rapidly from the ſouth, and in direct oppoſition to the Eteſian winds.

151 Of the hot winds.

Beſides the ordinary winds here ſpoken of, Egypt is infeſted with the deſtructive blaſts common to all warm countries which have deſerts in their neighbourhood. Theſe have been diſtinguiſhed by various names, ſuch as *poiſonous winds*, *hot winds of the deſert*, *Samiel*, *the wind of Damaſcus*, *Kamſin*, and *Simoom*. In Egypt they are denominated "winds of 50 days," becauſe they moſt commonly prevail during the 50 days preceding and following the equinox; though, ſhould they blow conſtantly during one half of that time, an univerſal deſtruction would be the conſequence. Of theſe travellers have given various deſcriptions. M. Volney ſays, that the violence of their heat may be compared to that of a large oven at the moment of drawing out the bread. They always blow from the ſouth; and are undoubtedly owing to the motion of the atmoſphere over ſuch vaſt tracts of hot ſand, where it cannot be ſupplied by a ſufficient quantity of moiſture. When they begin to blow, the ſky loſes its uſual ſerenity, and aſſumes a dark, heavy, and alarming aſpect, the ſun himſelf laying aſide his uſual ſplendor, and becoming of a violet colour. This terrific appearance ſeems not to be occaſioned by any real haze or cloud in the atmoſphere at that time, but ſolely to the vaſt quantity of fine ſand carried along by thoſe winds, and which is ſo exceſſively ſubtile that it penetrates every where. The motion of this wind is always rapid, but its heat is not intolerable till after it has continued for ſome time. Its pernicious qualities are evidently occaſioned by its exceſſive avidity of moiſture. Thus it dries and ſhrivels up the ſkin; and by doing the ſame to the lungs, will in a ſhort time produce ſuffocation and death. The danger is greateſt to thoſe of a plethoric habit of body, or who have been exhauſted by fatigue; and putrefaction ſoon takes place in the bodies of ſuch as are deſtroyed by it. Its extreme dryneſs is ſuch, that water ſprinkled on the floor evaporates in a few minutes; all the plants are withered and ſtripped of their leaves; and a fever is inſtantly produced in the human ſpecies by the ſuppreſſion of perſpiration. It uſually laſts three days, but is altogether inſupportable if it continue beyond that time. The danger is greateſt when the wind blows in ſqualls, and to travellers who happen to be expoſed to its fury without any ſhelter. The beſt method in this caſe is to ſtop the noſe and mouth with an handkerchief. Camels, by a natural inſtinct, bury their noſes in the ſand, and keep them there till the ſquall is over. The inhabitants, who have an opportunity of retiring to their houſes, inſtantly ſhut themſelves up in them, or go into pits made in the earth, till the deſtructive blaſt be over.

The deſcription of a blaſt of this kind which overtook Mr Bruce in the deſert of Nubia is ſtill more terrible than that juſt given from M. Volney. We have already mentioned ſomething of the pillars of moving ſand raiſed by the winds in the deſert. Theſe were obſerved by our traveller on this occaſion in all their terrific majeſty. Sometimes they appeared to move ſlowly; at other times with incredible ſwiftneſs, ſo that they could not have been avoided by the fleeteſt horſe. Sometimes they came ſo near, that they threatened deſtruction to the whole company Frequently the tops, when arrived at an immenſe height, ſo that they were loſt in the clouds, ſuddenly ſeparated from the bodies, and diſperſed themſelves in the air; and ſometimes the whole column broke off near the middle, as if it had received a cannon ſhot; and their ſize was ſuch, that, at the diſtance of about three miles, they appeared ten feet in diameter. Next day they appeared of a ſmaller ſize, but more numerous, and ſometimes approached within two miles of the company. The ſun was now obſcured by them, and the tranſmiſſion of his rays gave them a dreadful appearance, reſembling pillars of fire. This was pronounced by the guide to be a ſign of the approaching *Simoom* or hot wind; and he directed, that, when it came, the people ſhould fall upon their faces and keep their mouths on the ſand, to avoid the drawing in this pernicious blaſt with their breath. On his calling out that the Simoom was coming, Mr Bruce turned for a moment to the quarter from whence it came, which was the ſouth-eaſt. It appeared like a haze or fog of a purple colour, but leſs bright than the purple part of the rainbow; ſeemingly about 20 yards in breadth, and about 12 feet high from the ground. It moved with ſuch rapidity, that before he could turn about and fall upon his face, he felt the vehement heat of its current upon his face; and even after it paſſed over, which was very quickly, the air which followed was of ſuch an heat as to threaten ſuffocation. Mr Bruce had unfortunately inſpired ſome part of the pernicious blaſt; by which means he almoſt entirely loſt his voice, and became ſubject to an aſthmatic complaint, from which he did not get free for two years. The ſame phenomenon occurred twice more on their journey thro' this deſert. The ſecond time, it came from the ſouth a little to the eaſt: but it now ſeemed to have a ſhade of blue along with the purple, and its edges were leſs perfectly defined; reſembling rather a thin ſmoke, and having about a yard in the middle tinged with blue and purple. The third time, it was preceded by an appearance of ſandy pillars more magnificent than any they had yet obſerved; the ſun ſhining through them in ſuch a manner as to give thoſe which were neareſt a reſemblance of being ſpangled with ſtars of gold. The ſimoom which followed had the ſame blue and purple appearance as before, and was followed by a moſt ſuffocating wind for two hours, which reduced our travellers to the loweſt degree of weakneſs and deſpondency. It was remarkable that this wind always came from the ſouth-eaſt, while the ſandy pillars, which prognoſticated its approach, affected to keep to the weſtward, and to occupy the vaſt circular ſpace incloſed by the Nile to the weſt of their route, going round by Chaigie towards Dongola. The heaps of ſand left by them when they fell, or raiſed by the whirlwinds which carried them up, were 12 or 13 feet high, exactly conical, tapering to a fine point, and their baſes well proportioned.

152
Of the inhabitants of Egypt.

The inhabitants of Egypt may now be diſtinguiſhed into four diſtinct races of people.

I. The *Arabs*, who may be ſubdivided into three claſſes. 1. The poſterity of thoſe who ſettled here immediately after the conqueſt of the country by Amrou Ebn Al As the khalif Omar's general. 2. The *Magrebians*, or Weſtern Arabs, who at different times have migrated from the countries to the weſtward of Egypt, and are deſcended from the Saracen conquerors of Mauritania. 3. The *Bedouins*, or Arabs of the deſert, known to the ancients by the name of *Scenites*, or dwellers in tents. The firſt of theſe claſſes are now found among the huſbandmen and artizans; and are diſtinguiſhed from the others by being of a more robuſt habit of body, as well as of a larger ſtature than the others. They are in general five feet four inches high; and many of them attain two or three inches more, and are muſcular without being fleſhy. Their countenances are almoſt black, but their features are not diſagreeable; and as thoſe of the country do not ally themſelves in marriage but with the people of their own tribe, their faces have all a ſtrong reſemblance to each other. This is not the caſe with ſuch as live in towns, by reaſon of their promiſcuous marriages. The ſecond claſs are more numerous in the Said, where they have villages and even diſtinct ſovereigns of their own. Like the former, they apply themſelves to agriculture and mechanical occupations. The Bedouins paſs their lives among the rocks, ruins, and ſequeſtrated places where they can find water; ſometimes uniting in tribes and living in low ſmoky tents, and ſhifting their habitations from the deſert to the banks of the river and back again, as beſt ſuits their conveniency. Their time of inhabiting the deſert is the ſpring; but after the inundation they take up their reſidence in Egypt, in order to profit by the fertility of the country. Some farm lands in the country which they cultivate, but change annually. In general, all theſe Bedouins are robbers, and are a great terror to travellers as well as to the huſbandmen; but though their number is eſtimated at not leſs than 30,000, they are diſperſed in ſuch a manner that they cannot attempt any thing of conſequence.

II. The *Copts* are deſcendants of thoſe inhabitants of Egypt whom the Arabs ſubdued, and who were compoſed of original Egyptians, Perſians, and Greeks. M. Volney is of opinion that their name of Copts is only an abbreviation of the Greek word *Aigouptios*, an Egyptian. They are principally to be met with in the Said, though ſome alſo inhabit the Delta. They have all a yellowiſh duſky complexion, puffed up viſage, ſwoln eyes, flat noſes, and thick lips; and in fact the exact countenance of a mulatto. M. Volney, from a view of the ſphynx, and finding its features to be ſuch as is juſt now deſcribed, concludes, that the ancient Egyptians were real negroes; which he thinks is likewiſe confirmed by a paſſage in Herodotus, where he concludes, that the inhabitants of Colchis were deſcended from the Egyptians, "on account of the blackneſs of their ſkins and frizzled hair." M. Volney alſo remarks, that the countenance of the negroes is ſuch as exactly repreſents that ſtate of contraction aſſumed by our faces when ſtrongly affected by heat. The eye-brows are knit, the cheeks riſe, the eye-lids are contracted, and the mouth diſtorted; and this ſtate of contraction to which the features of the negroes are perpetually expoſed in the hot climates they inhabit, is become particularly characteriſtic. Exceſſive cold and ſnow produces the ſame effect; and hence this

this kind of countenance is alſo common among the Tartars; while, in the temperate climates, the features are proportionably lengthened, and the whole countenance expanded.

The Copts profeſs the Chriſtian religion, but follow the hereſy of the Eutychians, whence they have been perſecuted by the Greeks; but having at laſt got the better of their adverſaries, they are become the depoſitaries of the regiſters of the lands and tribes. At Cairo they are called *writers;* and are the intendants, ſecretaries, and collectors for government. The head of their claſs is writer to the principal chief; but they are all hated by the Turks to whom they are ſlaves, as well as by the peaſants whom they oppreſs. Their language bears a great reſemblance to the Greek; but they have five letters in their alphabet, as well as a number of words in their language, which may be conſidered as the remains of the ancient Egyptian. Theſe are found to bear a near reſemblance to the dialects of ſome of the neighbouring nations, as the Arabic, Ethiopian, Syriac, &c. and even of thoſe who lived on the banks of the Euphrates. The language of the Copts, however, has fallen into diſuſe for upwards of 300 years. On the conqueſt of the country by the Saracens, the latter obliged the people to learn their language; and about the year 722 the uſe of the Greek tongue was prohibited throughout the whole of their empire: the Arabic language then of courſe became univerſal; while the others, being only met with in books, ſoon became totally neglected. The true Coptic, therefore, though there is a tranſlation of the ſcriptures and many books of devotion written in it, is underſtood by nobody, not even the monks and prieſts.

III. The *Turks*, who have the title of being maſters of Egypt, but are chiefly to be met with at Cairo, where they poſſeſs the religious and military employments. Formerly they poſſeſſed alſo the poſts under government; but theſe are now occupied by the fourth race of inhabitants, viz.

IV. The *Mamlouks*. Of the origin of theſe we have already given ſome account: we have only, therefore, to relate ſome of the moſt remarkable particulars concerning their conſtitution and government, manners, &c.

Theſe people, as has already been mentioned, are the real maſters of Egypt; and in order to ſecure themſelves in the poſſeſſion of the country, they have taken ſeveral precautions. One of the principal of theſe is the degradation of the two military corps of azabs and janizaries, both of which were formerly very formidable. They have been able to effect this only in conſequence of the corrupt and wretched government of the Turks; for before the revolt of Ibrahim Kiaya, the Turkiſh troops, which ought to have conſiſted of 40,000, were reduced to leſs than half that number through the avarice and malverſation of their officers. Their degradation was completed by Ali Bey; who having firſt diſplaced all the officers who gave him any umbrage, left their places vacant, and ſo reduced the conſequence of the whole, that the azabs and janizaries are now only a rabble of vagabonds, who dread the Mamlouks as much as the meaneſt of the populace. The principal body of the Mamlouks reſide at Cairo; but many of them are diſperſed through the country, in order to keep up their authority, collect the tribute, and oppreſs the people: yet it ſhould ſeem very eaſy for the Porte to diſpoſſeſs them of this uſurped authority, as their number is ſuppoſed not to exceed 8500, including among theſe a great many youth under 20 years of age.

153
Abſurd dreſs and accoutrements of the Mamlouks.

The Mamlouks are all horſemen; and as war is accounted the only honourable employment among them, it is reckoned diſgraceful to walk on foot, none but cavalry being accounted ſoldiers. The other inhabitants are allowed only the uſe of mules and aſſes; and the ſame mark of indignity is impoſed upon Europeans; though, by proper management and liberal preſents, this may be got over. In the year 1776 lord Algernoun Percy afterwards lord Louvaine, and the earl of Charlemont, obtained permiſſion to ride upon horſeback. The Mamlouks, however, are not incited to this continual appearance on horſeback merely by their ſuppoſed ſuperiority to the reſt of the inhabitants; it is rendered neceſſary by their dreſs, which is extremely unwieldy and cumberſome. It conſiſts of a wide ſhirt of thin yellowiſh-coloured cotton; over which is a gown of Indian linen, or ſome of the light ſtuffs of Damaſcus or Aleppo. Over this is a ſecond covering of the ſame form and wideneſs, with ſleeves reaching down to the ends of the fingers. The former covering is called *antari*, and the latter *caftan*. The caftan is uſually made of ſilk or ſome finer ſtuff than the under garments; and both of them are faſtened by a long belt, which divides the whole dreſs into two bundles. Over all theſe they have a third, named *djouba*, conſiſting of cloth without lining, and made nearly ſimilar to the others, but that the ſleeves are cut in the elbow. This coat is lined, ſometimes even in ſummer, with fur; and as if all this was not ſufficient, they have an outer covering called the *beniche*, which is the cloak or robe of ceremony; and ſo completely covers the body, that even the ends of the fingers are not to be ſeen. Thus, when the beniche and other accoutrements are on, the whole body appears like a long ſack, with a bare neck and bald head covered with a turban thruſt out of it. This turban is called a *kaouk;* and is of a cylindrical form, yellow, and turned up on the outſide with a roll of muſlin artificially folded up. On their feet they have a ſock of yellow leather reaching up to the heels, ſlippers without any quarters, which conſequently are always ready to be left behind in walking. Laſtly, to complete this extraordinary dreſs, they have a kind of pantaloon or trowſers, long enough to reach up to the chin, and ſo large that each of the legs is big enough to contain the whole body; but that they may walk more at their eaſe under ſuch a number of impediments, they tie all the looſe parts of their dreſs with a running ſaſh. "Thus ſwaddled (ſays M. Volney), we may imagine the Mamlouks are not very active walkers; and thoſe who are not acquainted by experience with the prejudices of different countries, will find it ſcarcely poſſible to believe that they look on this dreſs as exceedingly commodious. In vain we may object that it hinders them from walking, and encumbers them unneceſſarily on horſeback; and that in battle a horſeman once diſmounted is a loſt man. They reply, *It is the cuſtom*, and every objection is anſwered."

In the accoutrements of their horſes, the Mamlouks are almoſt equally abſurd. The ſaddle is a clumſy piece of furniture, weighing with the ſaddle-cloths not leſs than 25 pounds; while the weight of the ſtirrups is never leſs than 9 or 10 pounds, nay, frequently exceeds 13. On the back-part of the ſaddle riſes a truſſequin about eight inches in height. while a pummel before projects four or five inches. in ſuch a manner as to endanger the breaſt of the horſeman if he ſhould happen to ſtoop. Inſtead of a ſtuffed frame, they have three thick woollen coverings below the ſaddle; the whole being faſtened by a ſurcingle, which, inſtead of a buckle, is tied with leather thongs in very complicated knots, and liable to ſlip. Inſtead of a crupper they have a large martingale which throws them upon the horſes ſhoulders. The ſtirrups are made of copper, longer and wider than the foot, having circular edges an inch high in the middle, and gradually declining toward each end. The edges are ſharp, and uſed inſtead of ſpurs, by which means the poor animal's ſides are much wounded. The weight of the furniture has already been mentioned; and is the more ridiculous as the Egyptian horſes are very ſmall. The bridle is equally ill contrived, and greatly injures the horſe's mouth, eſpecially by reaſon of the violent method they have of managing the animal. Their uſual way is to put the horſe to a full gallop, and ſuddenly ſtop him when at full ſpeed. Thus checked by the bit, he bends in his hind legs, ſtiffens the fore ones, and moves along as if he ſcarce had joints in his body: yet, notwithſtanding all thoſe diſadvantages, our author acknowledges that they are vigorous horſemen, having a martial appearance which pleaſes even ſtrangers.

154
Their arms, education, &c.

In the choice of their arms they have ſhown themſelves more judicious. Their principal weapon is an Engliſh carbine about 30 inches long; but ſo large in the bore, that it can diſcharge 10 or 12 balls at a time, which can ſcarce fail of doing great execution even from the moſt unſkilful hand. Beſides two large piſtols carried in the belt, they have ſometimes a heavy mace at the bow of the ſaddle for knocking down their enemy; and by the ſhoulder-belt they ſuſpend a crooked ſabre meaſuring 24 inches in a ſtraight line from the hilt to the point, but 30 at leaſt in the curve. The reaſon of the preference given to the crooked blade is, that the effect of a ſtraight one depends merely on the force with which it falls, and is confined to a ſmall ſpace, but that of a crooked one is continued longer by the action of the arm in retiring. The Mamlouks commonly procure their ſabres from Conſtantinople, or other parts of Europe; but the beys rival each other in thoſe of Perſia and ſuch as are fabricated of the ancient ſteel of Damaſcus. For theſe they frequently pay as high as 40l. or 50l. ſterling; but though it muſt be allowed that the edge of theſe weapons is exquiſitely keen, yet they have the defect of being almoſt as brittle as glaſs. The whole education and employment of the Mamlouks conſiſts in the exerciſe of theſe weapons, or what is conducive to it; ſo that we ſhould imagine they might at laſt become altogether irreſiſtible. Every morning the greater part of them exerciſe themſelves in a plain near Cairo, by firing their carbines and piſtols in the moſt expeditious manner, having an earthen veſſel for a mark to ſhoot at; and the perſon who breaks it is highly applauded by the beys who attend in order to encourage them. Here alſo they exerciſe themſelves in the uſe of the ſabre, as well as of the bow and arrows; though they do not any longer make uſe of theſe laſt in their engagements. Their favourite diverſion is throwing the *djerid*; a word properly ſignifying a reed, but which is generally made uſe of to ſignify any ſtaff thrown by the hand after the manner of the Roman pilum. In this exerciſe they make uſe of the branches of the palm-tree freſh ſtripped. Theſe branches, which have the form of the ſtalk of an artichoke, are about four feet long, and weigh five or ſix pounds. With theſe the cavaliers enter the liſts, riding full ſpeed, and throwing them afterwards at each other from a conſiderable diſtance. As ſoon as the aſſailant has thrown his weapon, he turns his horſe, and his antagoniſt purſues in his turn. The diverſion, however, frequently turns out very ſerious, as ſome are capable of throwing theſe weapons with force ſufficient to wound their antagoniſts mortally. Ali Bey was particularly dexterous at this kind of ſport, and frequently killed thoſe who oppoſed him. All theſe military exerciſes, however, are by no means ſufficient to render the Mamlouks formidable in the field. In their engagements they have neither order, diſcipline, nor even ſubordination; ſo that their wars are only ſcenes of robbery, plunder, and tumultuary encounters, which begin very often ſuddenly in the ſtreets of Cairo without the leaſt warning. If the contention happens to be transferred to the country, it is ſtill carried on in the ſame manner. The ſtrongeſt or moſt daring party purſues the other. If they are equal in courage, they will perhaps appoint a field of battle, and that without the leaſt regard to advantages of ſituation, but fighting in platoons, with the boldeſt champions at the head of each. After mutual defiances the attack begins, and every one chooſes out his man. After diſcharging their fire-arms, if they have an opportunity they attack with their ſabres; and ſuch as happen to be diſmounted are helped up again by their ſervants; but if nobody happens to be near, the ſervants will frequently kill them for the ſake of the money they carry about them. Of late, however, the ordinary Mamlouks, who are all ſlaves to the reſt, ſeem convinced that their patrons are the perſons principally intereſted; for which reaſon they reaſonably enough conclude that they ought to encounter the greateſt dangers. Hence they generally leave them to carry on the diſpute by themſelves; and being always ſure of finding a maſter who will employ them, they generally return quietly to Cairo until ſome new revolution takes place.

155
Are not formidable in war.

156
Their expenſive way of living.

The mode of living among the Mamlouks is exceedingly expenſive, as may eaſily be conceived from what has already been related. There is not one of them who does not coſt above 100l. Sterling annually, and many of them upwards of 200l. At every return of the faſt of Ramadan, their maſters muſt give them a new ſuit of French and Venetian cloths, with ſtuffs from India and Damaſcus. Frequently they require new horſes and harneſs: they muſt likewiſe have piſtols and ſabres from Damaſcus, with gilt ſtirrups, and ſaddles and bridles plated with ſilver. The chiefs are diſtinguiſhed from the vulgar by the trinkets and precious ſtones they wear; by riding Arabian horſes of 200l. or 300l. value, wearing ſhawls of Caſhmire in value from 25l. to 50l. each, with a variety of peliſſes, the cheapeſt of which coſts above 20l. Even the European merchants have given into this kind of extravagance;

vagance ; ſo that not one of them looks upon his wardrobe to be decently furniſhed unleſs it be in value 500 l. or 600 l.

157 ir bad acter.

Anciently it was cuſtomary for the women to adorn their heads with ſequins ; but this is now rejected as not ſufficiently expenſive. Inſtead of theſe, diamonds, emeralds, and rubies, are now ſubſtituted ; and to theſe they add French ſtuffs and laces. In other reſpects the character of the Mamlouks is almoſt the worſt that can be imagined Without affection, tie, or connection with each other or with the reſt of mankind, they give themſelves up without control to the moſt enormous vices ; and, according to M Volney, they are at once ferocious, perfidious, ſeditious, baſe, deceitful, and corrupted by every ſpecies of debauchery, not excepting even the unnatural vice ; of which he tells us not one is free, this being the very firſt leſſon each of them receives from his maſter, all being originally ſlaves, as has already been mentioned.

158 erable of the ptians.

As theſe are the preſent governors of Egypt, we may eaſily judge that the condition of the common people cannot be very agreeable. The greater part of the lands indeed are in the hands of the Mamlouks, beys, and profeſſors of the law, the property of all others being very precarious. Contributions are to be paid, or damages repaired, every moment ; and there is neither right of ſucceſſion nor inheritance for real property, but every thing muſt be purchaſed from government. The peaſants are allowed nothing but what is barely ſufficient to ſuſtain life. They cultivate rice and corn indeed, but are not at liberty to uſe either. The only food allowed them is dora or Indian millet, from which they make a kind of taſteleſs bread ; and of this, with water and raw onions, conſiſts all their fare throughout the year. They eſteem themſelves happy, therefore, if along with theſe they can ſometimes procure a little honey, cheeſe, ſour milk, or a few dates. They are very fond of fleſh meat and fat ; neither of which, however, they have an opportunity of taſting except at extraordinary feſtivals. Their ordinary dreſs conſiſts of a ſhirt of coarſe blue linen, and a clumſy black cloak ; with a ſort of black bonnet over their heads ; and over all they wear a long red woollen handkerchief. Their arms, legs, and breaſts, are naked, and moſt of them do not even wear drawers. They live in mud-walled huts of the moſt miſerable conſtruction, where they are expoſed to the inconveniences of ſmoke, heat, and unwholeſome air ; to all which are to be added the continual fears they live in of being robbed by the Arabs, oppreſſed by the Mamlouks, or ſome other grievous calamity. The only converſation is concerning the inteſtine troubles and miſery of the country, murders, baſtinadoes, and executions. Here ſentence of death is executed without the leaſt delay or form of trial. The officers who go the rounds in the ſtreets either by night or day, are attended by executioners, who carry along with them leathern bags for receiving the heads they cut off in theſe expeditions. Even the appearance of guilt is not neceſſary to infer a capital puniſhment ; for frequently nothing more is requiſite than the poſſeſſion of wealth, or being ſuppoſed to poſſeſs it. In this caſe the unfortunate perſon is ſummoned before ſome bey ; and when he makes his appearance, a ſum of money is demanded of him. If he denies that he poſſeſſes it, he is thrown on his back, and receives two or three hundred blows on the ſoles of his feet, nay perhaps is put to death without any ceremony. The only ſecurity of thoſe who poſſeſs any wealth in this country therefore is, to preſerve as great an appearance of poverty as poſſible.

159 Diſeaſes prevalent in this country.

Though the climate of Egypt is far from being unhealthy ; yet there are not a few diſeaſes which ſeem to be peculiar to it, and to have their origin either from the conſtitution of the atmoſphere, or the manner of living of the inhabitants. One of theſe till lately has been ſuppoſed to be the plague ; which opinion we find ſupported by Dr Mead, who has endeavoured to aſſign a natural reaſon why it ſhould take its origin in this country. But it is now univerſally agreed, that the plague never originates in the interior parts of Egypt, but always begins at Alexandria, paſſing ſucceſſively from thence to Roſetta, Cairo, Damietta, and the reſt of the Delta. It is likewiſe obſerved, that its appearance is always preceded by the arrival of ſome veſſel from Smyrna or Conſtantinople ; and that, if the plague has been very violent in either of theſe cities, the danger to Egypt is the greater. On proper inquiry, it is found to be really a native of Conſtantinople ; from whence it is exported by the abſurd negligence of the Turks, who refuſe to take any care to prevent the ſpreading of the infection. As they ſell even the clothes of the dead without the leaſt ceremony, and ſhips laden with this pernicious commodity are ſent to Alexandria, it is no wonder that it ſhould ſoon make its appearance there. As ſoon as it has reached Cairo, the European merchants ſhut themſelves up with their families in their *khans* or lodgings, taking care to have no further communication with the city. Their proviſions are now depoſited at the gate of the khan, and are taken up by the porter with iron tongs ; who plunges them into a barrel of water provided for the purpoſe. If they have occaſion to ſpeak to any perſon, they take care to keep at ſuch a diſtance as to avoid touching or even breathing upon each other. By theſe precautions they certainly eſcape the general calamity, except by accident ; and it not long ago happened that the diſeaſe was conveyed by a cat into the dwellings of the French merchants in Cairo ; by which two were infected, and one died. In this manner they are impriſoned for three or four months, without any other amuſement than walking on their terraces in the evenings, cards, or converſation with one another. There is a remarkable difference betwixt the plague at Conſtantinople and in Egypt. In the former, it is moſt violent in ſummer ; and in the latter in winter, ending there always in the month of June. It is alſo remarkable, that the water-carriers of Egypt, whoſe backs are conſtantly wet from the nature of their occupation, never have the plague. It appears in Egypt every fourth or fifth year, when it makes ſuch ravages as would depopulate the country, were it not for the vaſt concourſe of ſtrangers which arrive here every year from all parts of the Turkiſh empire.

A malady which ſeems in reality to be peculiar to Egypt is blindneſs. This is ſo common at Cairo, as M. Volney informs us, that out of 100 people whom he has met on the ſtreet, he might reckon 20 quite blind ; 10 without the ſight of one eye ; and 20 others with their eyes red, purulent, or blemiſhed. Almoſt every one, ſays he, wears a fillet, a token of an approaching or convaleſcent ophthalmy. In conſidering the cauſes of this diſorder, he reckons the ſleeping upon terraces to be a principal one. The ſouth wind, he ſays, cannot be the cauſe; otherwiſe the Bedouins would be equally ſubject to it with the Egyptians themſelves: but what is with the greateſt probability to be aſſigned as the cauſe, according to our author, is the very poor and little nutritive food which the natives are obliged to uſe. "The cheeſe, ſour-milk, honey, confection of grapes, green fruits, and raw vegetables (ſays he), which are the ordinary food of the people, produce in the ſtomach a diſorder which phyſicians have obſerved to affect the ſight; the raw onions, eſpecially, which they devour in great quantities, have a peculiar heating quality, as the monks of Syria made me remark on myſelf. Bodies thus nouriſhed, abound in corrupted humours, which are conſtantly endeavouring a diſcharge. Diverted from the ordinary channels, by habitual perſpiration, theſe humours fly to the exterior parts, and fix themſelves where they find the leaſt reſiſtance. They therefore naturally attack the head, becauſe the Egyptians, by ſhaving it once a-week, and covering it with a prodigiouſly hot head-dreſs, principally attract to it the perſpiration; and if the head receives ever ſo ſlight an impreſſion of cold on being uncovered, this perſpiration is ſuppreſſed, and falls upon the teeth, or ſtill more readily on the eyes as being the tendereſt part. It will appear the more probable that the exceſſive perſpiration of the head is a principal cauſe, when we reflect that the ancient Egyptians, who went bare-headed, are not mentioned by phyſicians as being ſo much afflicted with ophthalmies; though we are informed by hiſtorians that ſome of the Pharaohs died blind. The Arabs of the deſert alſo, who cover the head but little, eſpecially when young, are alſo very little ſubject to them." In this country blindneſs is often the conſequence of the ſmall-pox, a diſorder very frequent and very fatal among the Egyptians; and no doubt the more dangerous on account of their abſurd method of treating it, of which it is needleſs to enter into any diſcuſſion in this place. They are not unacquainted with inoculation; but ſeem not to be ſenſible of its advantages, as they very ſeldom practiſe it.

To the ſame cauſe, *viz.* unwholeſome food, M. Volney aſcribes the general deformity of the beggars, and the miſerable appearance of the children; which he ſays are no where ſo wretched. "Their hollow eyes, pale and puffed faces, ſwollen bellies, meagre extremities, and yellow ſkins, make them always ſeem as if they had not long to live. Their ignorant mothers pretend that this is the effect of the *evil eye* of ſome envious perſon, who has bewitched them; and this ancient prejudice is ſtill general in Turkey: but the real cauſe is the badneſs of their food. In ſpite of the taliſmans, therefore, an incredible number of them periſh; nor is any city more fatal to the population of the neighbouring country than Grand Cairo."

The venereal diſeaſe, which, for reaſons beſt known to themſelves, the inhabitants call the *bleſſed evil*, is ſo general at Cairo, that one half of the inhabitants are infected. It is extremely difficult to cure, though the ſymptoms are comparatively very mild, inſomuch that people who are infected with it will frequently live to the age of 80; but it is fatal to children born with the infection, and exceedingly dangerous to ſuch as emigrate to a colder climate.

Beſides theſe, there are two uncommon diſeaſes met with in Egypt, *viz.* a cutaneous eruption which returns annually; and a ſwelling of the teſticles, which often degenerates into an enormous hydrocele. The former comes on towards the end of June or beginning of July, making its appearance in red ſpots and pimples all over the body, occaſioning a very troubleſome itching. The cauſe of this diſtemper, in M. Volney's opinion, is the corruption of the waters of the Nile, which towards the end of April become very putrid, as has already been obſerved. After this has been drunk for ſome time, the waters of the inundation, which are freſh and wholeſome, tend to introduce ſome change in the blood and humours; whence a cutaneous eruption is the natural conſequence.

The hydrocele moſt commonly attacks the Greeks and Copts; and is attributed to the quantity of oil they make uſe of, as well as to their frequent hot-bathing. Our author remarks, that "in Syria as well as in Egypt, conſtant experience has ſhown, that brandy diſtilled from common figs, or from the fruit of the ſycamore tree, as well as from dates and the fruit of the nopal, has a moſt immediate effect on the teſticles, which it renders hard and painful the third or fourth day after it has been drunk; and if the uſe of it be not diſcontinued, the diſorder degenerates into a confirmed hydrocele. Brandy diſtilled from dried raiſins has not the ſame effect: this is always mixed with aniſeeds; and is very ſtrong, being diſtilled three times. The Chriſtians of Syria and the Copts of Egypt make great uſe of it; the latter eſpecially drink whole bottles of it at their ſupper. I imagined this an exaggeration; but I have myſelf had ocular proofs of its truth, though nothing could equal my aſtoniſhment that ſuch exceſſes do not produce inſtant death, or at leaſt every ſymptom of the moſt inſenſible drunkenneſs."

In the ſpring ſeaſon malignant fevers prevail in this country; concerning which our author mentions no remarkable particular, but that eggs are a kind of poiſon, and that bleeding is very prejudicial. He recommends a vegetable diet, and the bark in very large quantity.

160
Commer
of Cairo
conſiderable.

Notwithſtanding the oppreſſion which the Egyptians labour under, a very conſiderable trade is carried on from Cairo. This flouriſhing ſtate of commerce in the midſt of the moſt deſperate barbarity and deſpotiſm is owing to three cauſes. 1. That all the commodities conſumed in Egypt are collected within the walls of that city. 2. That the Mamlouks and all the people of property reſide in that place, and there ſpend their whole revenues. 3. By the ſituation of this city it is a centre of circulation; correſponding with Arabia and India, by the Red Sea; with Abyſſinia and the interior parts of Africa, by the Nile; and with Europe and the Turkiſh empire, by means of the Mediterranean. A caravan comes here annually from Abyſſinia, bringing from 1000 to 1200 ſlaves, with gum, ivory, gold-duſt, oſtrich-feathers, parrots, and monkeys.—Another, which ſets out from the extreme parts of Morocco, takes in pilgrims for Mecca from all that country as far ſouth as the mouth of the river Senegal. It conſiſts of not fewer than three or four thouſand camels;

mels; and, paſſing along the coaſts of the Mediterranean, collects likewiſe the pilgrims from Algiers, Tripoli, and Tunis, arriving at laſt at Alexandria by the way of the deſert. Proceeding thence to Cairo, it joins the Egyptian caravan; and then ſetting out both together, they take their journey to Mecca, from whence they return in one hundred days; but the Morocco pilgrims, who have ſtill 600 leagues to go, are upwards of a year in returning. The commodities they bring along with them are, India ſtuffs, ſhawls, gums, perfumes, pearls, and principally coffee. Beſides the profits of this merchandize, conſiderable ſums ariſe from the duties paid by pilgrims, and the ſums expended by them.

The caravans above mentioned are not the only means by which theſe commodities are brought to Cairo. They arrive alſo at Suez, to which port the ſoutherly winds bring in the month of May ſix or eight and twenty ſail of veſſels from Jedda. Small caravans likewiſe arrive from time to time from Damaſcus with ſilk and cotton ſtuffs, oils, and dried fruits. During the proper ſeaſon there are alſo a number of veſſels in the road of Damietta, unloading hogſheads of tobacco from Latakia, vaſt quantities of which are conſumed in this country. For this commodity rice is taken in exchange; while other veſſels bring clothing, arms, furs, paſſengers, and wrought ſilk from Conſtantinople. There are other veſſels which come from Marſeilles, Leghorn, and Venice, with cloths, cochineal, Lyons ſtuffs and laces, grocery ware, paper, iron, lead, Venetian ſequins, and German dahlers. Theſe are conveyed to Roſetta in barks called by M. Volney *djerm*, but which ſeem to be the ſame mentioned by Mr Bruce under the name of *canja*, and which are particularly deſcribed by him. He informs us, that there is a peculiarity in the form of this veſſel which makes it uſeful for navigating the river Nile; and that is, that the keel is not ſtraight, but a portion of a parabola, whoſe curve is almoſt inſenſible to the eye. Hence, as ſand-banks are very common in the Nile, and veſſels are apt to ſtrike them when the water becomes low, the middle of the canja will be aground while the extremities are afloat, and thus by means of oars and other aſſiſtance, it is always poſſible to get clear; but were the keel ſtraight, this would be altogether impoſſible, by reaſon of the vaſt ſails thoſe veſſels carry, which would urge them on with too much force to be recovered. The accommodation on board thoſe veſſels is much better than what could be expected: but they are liable to the depredations of robbers, who either ſwim under water in the day time, or upon goats ſkins during the night; though theſe ſeldom attack any boats where there are Europeans, whom they dread on account of their ſkill in fire-arms.

51 ls na- the de- l.

From ſo many ſources we need not wonder that the commerce of Cairo ſhould be in a very flouriſhing ſtate. In 1783, according to the report of the commiſſioner-general of the cuſtoms, it amounted to no leſs than 6,250,000 l. but notwithſtanding this ſhow of wealth, the trade carried on at Cairo contributes very little to the enriching of the people. This will readily appear, when we conſider, that great part of the coffee and other merchandiſe brought from India is exported to foreign countries, the value being paid in goods from Turkey and other European countries; while the country conſumption conſiſts entirely, or moſtly, in articles of luxury already finiſhed, and the produce given in return is moſtly in raw materials.

162
Of cutting through the Iſthmus of Suez.

Schemes have frequently been projected of enlarging the commerce of Egypt by cutting through the Iſthmus of Suez, and thus joining the Mediterranean and Red Seas by a canal. This is looked upon by M. Volney as impracticable. He owns, indeed, that no objection can ariſe from the diſtance, which is not more than 18 or 19 leagues; neither does any obſtacle ariſe from mountains, or the inequality of levels, the whole being a ſandy barren plain. The difficulty, which he conſiders as inſuperable, proceeds from the nature of the correſponding coaſts of the Mediterranean and Red Seas; both of which are low and ſandy, where the water forms lakes, ſhoals, and moraſſes, ſo that ſhips cannot come within a conſiderable diſtance of either; and it would be ſcarce poſſible to cut a permanent canal amidſt theſe ſhifting ſands: not to mention, that the ſhore is deſtitute of harbours, which muſt be entirely the work of art. The country, beſides, has not a drop of freſh water; which it would therefore be neceſſary to bring as far as from the Nile. The beſt method of effecting this junction therefore is by means of the river itſelf; and for this the ground is perfectly well calculated. This has been already done by ſeveral Egyptian princes, particularly Seſoſtris; and the canal is ſaid to have been 170 feet wide, and deep enough for large veſſels. After the Grecian conqueſt it was renewed by the Ptolemies, then by Trajan, and laſtly by the Arabs. Part of it ſtill remains, running from Cairo to the north-eaſt of the *Berket-el-Hadj*, or Lake of the Pilgrims, where it loſes itſelf. At preſent the commerce with Suez is only carried on by means of caravans, which ſet out towards the end of April or beginning of May, or in the months of July and Auguſt; waiting the arrival of the veſſels, and ſetting out on their departure. The caravans are very numerous; that with which M. Volney travelled conſiſting of 5000 or 6000 men and 3000 camels. The country is as deſert and barren as poſſible, without a ſingle tree or the ſmalleſt ſpot of verdure; ſo that every neceſſary for thoſe who accompany the caravan muſt be carried on the backs of the camels, wood and water not excepted.

The cuſtom-houſes of Egypt are in the hands of the Chriſtians of Syria. Formerly they were managed by Jews; but theſe were completely ruined by the extortions of Ali Bey in 1769. The Syrian Chriſtians came from Damaſcus ſomewhat more than 50 years ago; and having by their economy and induſtry gained poſſeſſion of the moſt important branches of commerce, they were at length enabled to farm the cuſtom-houſes, which is an office of great conſequence. There were at firſt only three or four families of them; but their number has ſince increaſed to more than 500, and they are reckoned very opulent.

163
Low ſtate of the arts and learning.

From what has already been ſaid concerning the ſtate of the Egyptians, we may naturally conclude, that the arts and all kinds of learning are at a very low ebb among them. Even the moſt ſimple of the mechanical profeſſions are ſtill in a ſtate of infancy. The work of their cabinet-makers, gunſmiths, and lockſmiths, is extremely clumſy. There are manufactures of gunpowder and ſugar; but the quality of both are very indifferent. The only thing in which they can be ſaid to arrive at any degree of perfection is the manufacture of ſilk ſtuffs; though even theſe are far leſs highly finiſhed than thoſe of Europe, and likewiſe bear a much higher price. One very extraordinary art indeed is ſtill extant among the Egyptians, and appears to have exiſted in that country from the moſt remote antiquity; and that is a power of enchanting the moſt deadly ſerpents in ſuch a manner, that they ſhall allow themſelves to be handled, nay even hurt in the ſevereſt manner, without offering to bite the perſon who injures them. Thoſe who have this art are named PSYLLI; to which article we refer for an account of what has been ſaid on the ſubject by ancient and modern travellers.

For a deſcription of thoſe ſtupendous and almoſt indeſtructible monuments of human grandeur, the pyramids, ſo often taken notice of and deſcribed by travellers; ſee the article PYRAMIDS.

EGYPTIANS, or GYPSIES. See GYPSIES.

EHRETIA, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 41ſt order, *Aſperifoliæ*. The fruit is a bilocular berry; the ſeeds ſolitary and bilocular; the ſtigma emarginated.

EHRHARTA, in botany: A genus of the monogynia order, belonging to the hexandria claſs of plants. The calyx is a two-valved, abbreviated, and one-flowered glume; the corolla is a double glume, each two-valved: the exterior one compreſſed, and ſcymeter-ſhaped, tranſverſely wrinkled, and gaſhed at the baſe. There are ſix ſtamina, three on each ſide the piſtil in a parallel line. The ſtigma is ſimple, compreſſed, four-tufted, and torn at the top.

EHUD, the ſon of Gera, a Benjamite, a man left-handed, who delivered Iſrael from the oppreſſion of Eglon king of Moab, under whom they ſerved for 18 years. See EGLON. It being cuſtomary for the Iſraelites to ſend a preſent or tribute to the king of Moab; in the year of the world 2579, being the laſt year of their ſervitude, Ehud was appointed to carry it, who having a deſign either to free his country from this oppreſſion, or periſh in the attempt, had for this purpoſe provided himſelf with a dagger which had two edges, and which he had concealed on his right ſide, (Judges iii. 15, &c.). After he had delivered the preſent, pretending he had ſomething of great importance to communicate to the king, he obtained a private audience of him; when taking his opportunity, he ſtabbed him with the poniard to the heart, and ſo ſhutting the door after him, had time to make his eſcape; for as the king was a very corpulent man, his attendants ſuppoſed that he was either repoſing or eaſing himſelf, and therefore forbore to enter his apartment until Ehud was quite gone. As ſoon as he came to mount Ephraim, he gathered together the Iſraelites that lay neareſt him, acquainted them with what he had done; and then ſecuring the fords of Jordan that none of them might eſcape, he fell upon the Moabites, and ſubdued them.

EIA, or EY, in our old writers, are uſed for an iſland. Hence the names of places ending in *ey*, denotes them to be iſlands. Thus, Ramſey, the iſle of rams; Shepey, the iſle of ſheep, &c.

EIA is alſo ſometimes uſed for water; and hence the names of places near waters or lakes terminate in *ey*.

EJACULATOR, in anatomy, a name applied to two muſcles of the penis from their office in the ejection of the ſeed. See ANATOMY, *Table of the Muſcles*.

EICETÆ, called alſo HEICETÆ and HICETÆ, heretics of the ſeventh century, who made profeſſion of the monaſtic life.— From that paſſage in Exodus, where Moſes and the children of Iſrael are ſaid to have ſung a ſong in praiſe of the Lord, after they had paſſed the Red Sea, wherein their enemies had periſhed; the eicetæ concluded, that they muſt ſing and dance to praiſe God aright; and as Mary the propheteſs, ſiſter of Moſes and Aaron, took a drum in her hand, on the ſame occaſion, and all the women did the like, to teſtify their joy, by playing, beating, and dancing; the eicetæ, the better to imitate their conduct herein, endeavoured to draw women to them to make profeſſion of the monaſtic life, and aſſiſt in their mirth.

EICK. See BRUGES.

EIDER-DUCK. See ANAS.

*EIDER-Down.* See DOWN.

EJECTA, a term uſed by lawyers for a woman deflowered or caſt from the virtuous.

EJECTION, in the animal economy, evacuation, or the diſcharging any thing through ſome of the emunctories, as by ſtool, vomit, &c

EJECTION, in Scots law, is the turning out the poſſeſſor of any heritable ſubject by force; and is either *legal* or *illegal*. Legal ejection is where a perſon having no title to poſſeſs, is turned out by the authority of law. Illegal ejection is one perſon's violently turning another out of poſſeſſion without lawful authority.

EJECTMENT, in Engliſh law, a writ or action which lies for the leſſee for years, on his being ejected or put out of his land, before the expiration of his term, either by the leſſor or a ſtranger. It may alſo be brought by the leſſor againſt the leſſee, for rent in arrears, or holding over his term, &c. Ejectment of late years is become an action in the place of many real actions, as writs of right, formedons, &c. which are very difficult, as well as tedious and expenſive; and this is now the common action for trial of titles, and recovering of lands, &c. illegally held from the right owner; yet where entry is taken away by diſcents, fines, recoveries, diſſeiſins, &. an ejectment ſhall not be brought; whereby we find that all titles cannot be tried by this action.

The method of proceeding in the action of ejectment is to draw up a declaration, and feign therein a leaſe for three, five, or ſeven years, to him that would try the title; and alſo feign a caſual ejector or defendant; and then deliver the declaration to the ejector, who ſerves a copy of it on the tenant in poſſeſſion, and gives notice at the bottom for him to appear and defend his title; or that he the feigned defendant will ſuffer judgment by default, whereby the true tenant will be turned out of poſſeſſion; to this declaration the tenant is to appear at the beginning of next term by his attorney, and conſent to a rule to be made defendant, inſtead of the caſual ejector, and take upon him the defence, in which he muſt confeſs leaſe, judgment, entry, and auſter, and at the trial ſtand upon the title only: but in caſe the tenant in poſſeſſion does not appear, and enter into the ſaid rule in time, after the declaration ſerved, then, on affidavit being made of the ſervice of the declaration, with the notice to appear as aforeſaid,

ſaid, the court will order judgment to be entered againſt the caſual ejector by default; and thereupon the tenant in poſſeſſion, by writ *habere facias poſſeſſionem*, is turned out of his poſſeſſion. On the trial in ejectment, the plaintiff's title is to be ſet forth from the perſon laſt ſeiſed in fee of the lands in queſtion, under whom the leſſor claims down to the plaintiff, proving the deeds, &c. and the plaintiff ſhall recover only according to the right which he has at the time of bringing his action. And here, another who hath title to the land, upon a motion made for that purpoſe, may be defendant in the action with the tenant in poſſeſſion, to defend his title; for the poſſeſſion of the lands is primarily in queſtion, and to be recovered, which concerns the tenant, and the title thereto is tried collaterally, which may concern ſome other.

EKRON, a city and government of the Philiſtines. It fell by lot to the tribe of Judah, in the firſt diviſion made by Joſhua (xv. 45.), but afterwards it was given to the tribe of Dan (*id.* xix. 43.) It was ſituated very near the Mediterranean, between Aſhdod and Jamnia. Ekron was a powerful city, and it does not appear by hiſtory that the Jews were ever ſole peaceable poſſeſſors of it: the Ekronites were the firſt who ſaid that it was neceſſary to ſend back the ark of the God of Iſrael, in order to be delivered from thoſe calamities which the preſence of it brought upon their country, (1 Sam. v. 10.) The idol Baalzebub was principally adored at Ekron (2 Kings i. 2, &c.)

ELÆAGNUS, OLEASTER, or *Wild Olive:* A genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 16th order, *Calyciſloræ*. There is no corolla; the calyx is campanulated, quadrifid, ſuperior; the fruit is a plum below the campanulated calyx. There are three ſpecies: 1. The ſpinoſa, or eaſtern broad-leaved olive with a large fruit, is a native of the Levant and ſome parts of Germany. The leaves are about two inches long, and one and a half broad in the middle. They are placed alternate, and of a ſilver colour: at the footſtalk of every leaf there comes out a pretty long ſharp thorn, which are alternately longer: the flowers are ſmall, the inſide of the empalement is yellow, and they have a ſtrong ſcent when fully open. 2. The inermis, without thorns, is that kind commonly preſerved in the gardens of this country. The leaves are more than three inches long, and half an inch broad, and have a ſhining appearance like ſattin. The flowers come out at the footſtalks of the leaves, ſometimes ſingly, at other times two, and ſometimes three, at the ſame place. The outſide of the empalement is ſilvery and ſtudded; the inſide of a pale yellow, and having a very ſtrong ſcent. The flowers appear in July, and are ſometimes ſucceeded by fruit. 3. The latifolia, with oval leaves, is a native of Ceylon, and ſome other parts of India. In this country it riſes with a woody ſtem to the height of eight or nine feet, dividing into many crooked branches, garniſhed with oval and ſilvery leaves, which have ſeveral irregular ſpots of a dark colour on the ſurface. They are placed alternately on the branches, and continue all the year.

*Culture*, &c. The two firſt may be propagated by laying down the young ſhoots in autumn. They will take root in one year; when they may be cut off from the old trees, and either tranſplanted into a nurſery for two or three years to be trained up, or into places where they are to remain. The proper time for this is in the beginning of March or early in the autumn. They ſhould be placed where they may be ſcreened from high winds; for they grow very freely, and are apt to be ſplit by the wind if they are too much expoſed. The third ſort is too tender to endure the open air of this country; and therefore muſt be kept in a warm ſtove, except during a ſhort time in the warmeſt part of ſummer.

From the flowers of theſe plants an aromatic and cordial water has been drawn, which is ſaid to have been ſucceſsfully uſed in putrid and peſtilential fevers. The genus elæagnus is not to be confounded with the oleaſter or wild olive of Gerard, Parkinſon, and Ray. The laſt is only a particular ſpecies of olive, called by Tourneſort and Caſpar Bauhine, *olea ſylveſtris*. See OLEA.

ELÆOCARPUS, in botany: A genus of the monogynia order, belonging to the polyandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The corolla is pentapetalous and lacerated; the calyx is pentaphyllous; and the fruit is a plum, with a wrinkled kernel.

ELÆOTHESIUM, in antiquity, the anointing room, or place where thoſe who were to wreſtle or had bathed anointed themſelves. See GYMNASIUM.

ELAIS, in botany; a genus belonging to the natural order of *Palmæ*. The male calyx is hexaphyllous; the corolla ſexfid; the ſtamina ſix: The female calyx is hexaphyllous; the corolla hexapetalous; the ſtigmata three; the fruit a fibrous plum, with a three-valved nut or kernel.

ELAM (anc. geog.), a country frequently mentioned in Scripture, and lying to the ſouth-eaſt of Shinar. In the time of Daniel (viii. 2.), Suſiana ſeems to have been part of it; and before the captivity, it does not appear that the Jews called Perſia by any other name. Elymæ and Elymais are often mentioned by the ancients. Ptolemy, though he makes Elymais a province of Media, yet he places the Elymæ in Suſiana, near the ſea-coaſt. Stephanus takes it to be a part of Aſſyria; but Pliny and Joſephus more properly of Perſia, whoſe inhabitants this latter tells us ſprang from the Elamites. The beſt commentators agree, that the Elamites, who were the anceſtors of the Perſians, were deſcended from Elam the ſon of Shem. It is likewiſe allowed, that the moſt ancient among the inſpired writers conſtantly intend Perſia, when they ſpeak of Elam and the kingdom of Elam. Thus, not to detain the reader with unneceſſary quotations, when the prophet Jeremiah (xlix. 39.), after denouncing many judgments againſt this country, adds theſe words, "But it ſhall come to paſs in the latter days, that I will bring again the captivity of Elam, ſaith the Lord," he is always underſtood to mean the reſtoration of the kingdom of the Perſians by Cyrus, who ſubdued the Babylonians, as they before had ſubdued the Perſians.

ELAPHEBOLIA, in Grecian antiquity, a feſtival in honour of Diana the huntreſs. In the celebration a cake was made in the form of a deer (ἐλαφος), and offered to the goddeſs. It owed its inſtitution to the following circumſtance: When the Phocians had been ſeverely

ſeverely beaten by the Theſſalians, they reſolved, by the perſuaſion of one Deiphantus, to raiſe a pile of combuſtible materials, and burn their wives, children, and effects, rather than ſubmit to the enemy. This reſolution was unanimouſly approved by the women, who decreed Deiphantus a crown for his magnanimity. When every thing was prepared, before they fired the pile, they engaged their enemies, and fought with ſuch deſperate fury, that they totally routed them, and obtained a complete victory. In commemoration of this unexpected ſucceſs, this feſtival was inſtituted to Diana, and obſerved with the greateſt ſolemnity.

ELAPHEBOLIUM, in Grecian antiquity, the ninth month of the Athenian year, anſwering to the latter part of February and beginning of March. It conſiſted of 30 days; and took its name from the feſtival elaphebolia, kept in this month, in honour of Diana the huntreſs, as mentioned in the preceding article.

ELASMIS, in natural hiſtory, a genus of talcs, compoſed of ſmall plates in form of ſpangles; and either ſingle, and not farther fiſſile; or, if complex, only fiſſile to a certain degree, and that in ſomewhat thick laminæ.—Of theſe talcs there are ſeveral varieties, ſome with large and others with ſmall ſpangles, which differ alſo in colour and other peculiarities.

ELASTIC, in natural philoſophy, an appellation given to all bodies endowed with the property of elaſticity. See ELASTICITY.

*Elastic Fluids.* See AIR, ELECTRICITY, GAS, and *Elastic Vapours* below.

*Elastic Reſin.* See CAOUTCHOUC.

*Elastic Vapours* are ſuch as may, by any external mechanical force, be compreſſed into a ſmaller ſpace than what they originally occupied; reſtoring themſelves, when the preſſure is taken off, to their former ſtate with a force exactly proportioned to that with which they were at firſt compreſſed. Of this kind are all the aerial fluids without exception, and all kinds of fumes raiſed by means of heat whether from ſolid or fluid bodies.

Of theſe, ſome retain their elaſticity only when a conſiderable degree of heat is applied to them or the ſubſtance which produces them; while others remain elaſtic in every degree of cold, either natural or artificial, that has yet been obſerved. Of the former kind are the vapours of water, ſpirit of wine, mercury, ſal ammoniac, and all kinds of ſublimable ſalts; of the latter, thoſe of ſpirit of ſalt, mixtures of vitriolic acid and iron, nitrous acid, and various other metals, and in ſhort the different ſpecies of aerial fluids indiſcriminately.

The elaſtic force with which any one of theſe fluids is endowed has not yet been calculated, as being ultimately greater than any obſtacle we can put in its way. Thus, if we compreſs the atmoſpherical air, we ſhall find that for ſome little time it will eaſily yield to the force we apply; but every ſucceeding moment the reſiſtance will become ſtronger, and a greater and greater force muſt be applied in order to compreſs it farther. As the compreſſion goes on, the veſſel containing the air becomes hot; but no power whatever has yet been able to deſtroy the elaſticity of the contained fluid in any degree; for upon removing the preſſure, it is always found to occupy the very ſame ſpace that it did before. The caſe is the ſame with aqueous ſteam, to which a ſufficient heat is applied to keep it from condenſing into water. This will yield to a certain degree; but every moment the reſiſtance becomes greater, until at laſt it will overcome any obſtacles whatever. An example of the power of this kind of ſteam we have every day in the ſteam engine; and the vapours of other matters, both ſolid and fluid, have frequently manifeſted themſelves to be endowed with an equal force. Thus the force of the vapours of ſpirit of wine has occaſioned terrible accidents when the worm has been ſtopped, and the head of the ſtill abſurdly tied down to prevent an exploſion; the vapours of mercury have burſt an iron box; and thoſe of ſal ammoniac, volatile ſalts, nitrous acid, marine acid, phoſphorus, &c. have all been known to burſt the chemical veſſels which confined them with great force, in ſuch a manner as to endanger thoſe who ſtood near them. In ſhort, from innumerable obſervations, it may be laid down as an undoubted fact, that there is no ſubſtance whatever capable of being reduced into a ſtate of vapour, but what in that ſtate is endowed with an elaſtic force ultimately ſuperior to any obſtacle we can throw in its way.

It hath been a kind of deſideratum among philoſophers to give a ſatisfactory reaſon for this aſtoniſhing power of elaſticity in vapour, ſeemingly ſo little capable of accompliſhing any great purpoſe when in an unconfined ſtate. As air is that fluid in which, from the many experiments made upon it by the air-pump and otherwiſe, the elaſtic property has moſt frequently been obſerved, the reſearches of philoſophers were at firſt principally directed towards it. The cauſes they aſſigned, however, were very inadequate; being founded upon an hypotheſis concerning the form of the particles of the atmoſphere itſelf, which they ſuppoſed to be either rolled up like the ſprings of watches, or that they conſiſted of a kind of elaſtic flakes. This was followed by another hypotheſis concerning their ſubſtance, which was imagined to be perfectly elaſtic, and ſo ſtrong that they could not be broken by any mechanical power whatever; and thus they thought the phenomenon of the elaſticity of the air might be explained. But an inſuperable difficulty ſtill attended their ſcheme, notwithſtanding both theſe ſuppoſitions; for it was obſerved, that the elaſtic power of the air was augmented not only in proportion to the quantity of preſſure it was made to endure, but in proportion to the degree of heat applied to it at the time. Sir Iſaac Newton was aware of this difficulty; and juſtly concluded, that the phenomena of the air's elaſticity could not be ſolved on any other ſuppoſition but that of a repulſive power diffuſed all around each of its particles, which became ſtronger as they approached, and weaker as they removed from each other. Hence the common phenomena of the air-pump and condenſing-engine received a ſatisfactory explanation; but ſtill it remained to account for the power ſhown in the preſent caſe by heat, as it could not be denied that this element had a very great ſhare in augmenting the elaſticity of the atmoſphere, and ſeemed to be the only cauſe of elaſticity in other vapours. It does not appear that Sir Iſaac entered into this queſtion, but contented himſelf with attributing to heat the property of in-

increaſing repulſion, and aſcribing this to another unexplored property called *rarefaction*. Thus matters ſtood till the great diſcovery made by Dr Black, that ſome bodies have the power of abſorbing in an unknown manner the element in queſtion, and parting with it afterwards, ſo that it flows out of the body which had abſorbed it with the very ſame properties that it had before abſorption. Hence many phenomena of heat, vapour, and evaporation, were explained in a manner much more ſatisfactory than had ever been attempted or even expected before. One of theſe was that remarkable property of metals becoming hot by hammering; during which operation, in the Doctor's opinion, the element of heat is ſqueezed out from between the particles of the metal as water is from the pores of a ſponge by preſſing it between the fingers. Of the ſame nature is the phenomenon above mentioned, that air when violently compreſſed becomes hot, by reaſon of the quantity of more ſubtle element ſqueezed out from among the particles. In this manner it appears that heat and the repulſive power of Sir Iſaac Newton are the very ſame; that by diminiſhing the heat of any quantity of air, its elaſticity is effectually diminiſhed, and it will of itſelf ſhrink into a ſmaller ſpace as effectually as by mechanical preſſure. In one caſe we have what may be called ocular demonſtration of the truth of this doctrine, viz. that by throwing the focus of a ſtrong burning lens upon a ſmall quantity of charcoal *in vacuo*, the whole will be converted into inflammable air, having even a greater power of elaſticity than common air in an equal degree of heat. Here there is nothing elſe but heat or light to produce the elaſtic power, or cauſe the particles of charcoal which before *attracted* now to repel each other. In another caſe we have evidence equally ſtrong, that the element of heat by itſelf, without the preſence of that of light, is capable of producing the ſame effect. Thus when a phial of ether is put into the receiver of an air-pump, and ſurrounded by a ſmall veſſel of water, the ether boils violently, and is diſſipated in vapour, while the water freezes, and is cooled to a great degree. The diſſipation of this vapour ſhows that it has an elaſtic force; and the abſorption of the heat from the water ſhows, that this element not only *produces* the elaſticity, but actually enters into the ſubſtance of the vapour itſelf; ſo that we have not the leaſt reaſon to conclude that there is any other repulſive power by which the particles are kept at a diſtance from one another than the ſubſtance of the heat itſelf. In what manner it acts, we cannot pretend exactly to explain, without making hypotheſes concerning the form of the minute particles of matter, which muſt always be very uncertain. All known phenomena, however, concur in rendering the theory juſt now laid down extremely probable. The elaſticity of the ſteam of water is exactly proportioned to the degree of heat which flows into it from without; and if this be kept up to a ſufficient degree, there is no mechanical preſſure which can reduce it into the ſtate of water. This, however, may very eaſily be done by abſtracting a certain portion of the latent heat it contains; when the elaſtic vapour will become a denſe and heavy fluid. The ſame thing may be done in various ways with the permanently elaſtic fluids. Thus the pureſt dephlogiſticated air, when made to part with its latent heat by burning with iron, is converted into a gravitating ſubſtance of an unknown nature, which adheres ſtrongly to the metal. If the decompoſition is performed by means of inflammable air, both together unite into an heavy, aqueous, or acid fluid; if by mixture with nitrous air, ſtill the heat is diſcernible, though leſs violent than in the two former caſes. The decompoſition indeed is ſlower, but equally complete, and the dephlogiſticated air becomes part of the nitrous acid, from which it may be again expelled by proper means: but of theſe means heat muſt always be one; for thus only the elaſticity can be reſtored, and the air be recovered in its proper ſtate. The ſame thing takes place in fixed air, and all other permanently elaſtic fluids capable of being abſorbed by others. The concluſion therefore which we can only draw from what data we have concerning the compoſition of elaſtic vapours is, that all of them are formed of a terreſtrial ſubſtance, united with the element of heat in ſuch a manner that part of the latter may be ſqueezed out from among the terreſtrial particles; but in ſuch a manner, that as ſoon as the preſſure is taken off, the ſurrounding fluid ruſhes in, and expands them to their original bulk: and this expanſion or tendency to it will be increaſed in proportion to the degree of heat, juſt as the expanſion of a ſponge would be exceedingly augmented, if we could contrive to convey a ſtream of water into the heart of it, and make the liquid flow out with violence through every pore in the circumference. In this caſe, it is evident that the water would act as a *power of repulſion* among the particles of the ſponge, as well as the fire does among the particles of the water, charcoal, or whatever other ſubſtance is employed. Thus far we may reaſon from analogy; but in all probability the internal and eſſential texture of theſe vapours will for ever remain unknown. Their obvious properties, as well as ſome of their more latent operations in many caſes, are treated of under a variety of articles in this work, as AEROLOGY, EVAPORATION, VOLCANO, &c.

It has been imagined by ſome, that the artificial elaſtic fluids have not the ſame mechanical property with common air, viz. that of occupying a ſpace inverſely proportional to the weights with which they are preſſed: but this is found to be a miſtake. All of them likewiſe have been found to be non-conductors of electricity, though probably not all in the ſame degree. Even aqueous vapour, when intimately mingled with any permanently elaſtic fluid, refuſes to conduct this fluid, as is evident from the highly electrical ſtate of the atmoſphere in very dry weather, when we are certain that aqueous vapour muſt abound very much, and be intimately mixed with it. The colour of the electric ſpark, though it may be made viſible in all kinds of permanently elaſtic vapours, is very different in different fluids. Thus in inflammable and alkaline air it is red or purple, but in fixed air it appears white.

**ELASTICITY**, or ELASTIC *Force*, that property of bodies wherewith they reſtore themſelves to their former figure, after any external preſſure.

The cauſe or principle of this important property elaſticity, or ſpringineſs, is variouſly aſſigned. The Carteſians account for it from the materia ſubtilis making an effort to paſs through pores that are too narrow for it. Thus, ſay they, in bending, or compreſſing, a hard elaſtic body, *e. gr.* a bow, its parts recede from each other on the convex ſide, and approach on the concave: conſequently the pores are contracted or ſtraitened on the concave ſide; and if they were before round, are now, for inſtance, oval: ſo that the materia ſubtilis, or matter of the ſecond element, endeavouring to paſs out of thoſe pores thus ſtraitened, muſt make an effort, at the ſame time, to reſtore the body to the ſtate it was in when the pores were more patent and round, *i. e.* before the bow was bent: and in this conſiſts its elaſticity.

Other later and more wary philoſophers account for elaſticity much after the ſame manner as the Carteſians; with this only difference, that in lieu of the ſubtile matter of the Carteſians, theſe ſubſtitute Ether, or a fine etherial medium that pervades all bodies.

Others, ſetting aſide the precarious notion of a materia ſubtilis, account for elaſticity from the great law of nature ATTRACTION, or the cauſe of the COHESION of the parts of ſolid and firm bodies. Thus, ſay they, when a hard body is ſtruck or bent, ſo that the component parts are moved a little from each other, but not quite disjointed or broke off, or ſeparated ſo far as to be out of the power of that attracting force whereby they cohere; they muſt certainly, on the ceſſation of the external violence, ſpring back to their former natural ſtate.

Others reſolve elaſticity into the preſſure of the atmoſphere: for a violent tenſion, or compreſſion, tho' not ſo great as to ſeparate the conſtituent particles of bodies far enough to let in any foreign matter, muſt yet occaſion many little vacuola between the ſeparated ſurfaces; ſo that upon the removal of the force they will cloſe again by the preſſure of the aerial fluid upon the external parts. See ATMOSPHERE.

Laſtly, others attribute the elaſticity of all hard bodies to the power of reſilition in the air included within them: and ſo make the elaſtic force of the air the principle of elaſticity in all other bodies.

*The ELASTICITY of Fluids* is accounted for from their particles being all endowed with a centrifugal force; when Sir Iſaac Newton, prop. 23. lib 2. demonſtrates, that particles, which naturally avoid or fly off from one another by ſuch forces as are reciprocally proportioned to the diſtances of their centre, will compoſe an elaſtic fluid, whoſe denſity ſhall be proportional to its compreſſion; and *vice verſa*, if any fluid be compoſed of particles that fly off and avoid one another, and hath its denſity proportional to its compreſſion, then the centrifugal forces of thoſe particles will be reciprocally as the diſtances of their centres.

*ELASTICITY of the Air*, is the force wherewith that element dilates itſelf, upon removing the force whereby it was before compreſſed. See AIR, and ATMOSPHERE.

The elaſticity or ſpring of the air was firſt diſcovered by Galileo. Its exiſtence is proved by this experiment of that philoſopher: An extraordinary quantity of air being intruded by means of a ſyringe into a glaſs or metal ball, till ſuch time as the ball, with this acceſſion of air, weigh conſiderably more in the balance than it did before; upon opening the mouth thereof, the air ruſhes out, till the ball ſink to its former weight. From hence we argue, that there is juſt as much air gone out, as compreſſed air had been crowded in. Air, therefore, returns to its former degree of expanſion, upon removing the force that compreſſed or reſiſted its expanſion; conſequently it is endowed with an elaſtic force. It muſt be added, that as the air is found to ruſh out in every ſituation or direction of the orifice, the elaſtic force acts every way, or in every direction.

The elaſticity of the air makes a conſiderable article in PNEUMATICS.

The cauſe of the elaſticity of the atmoſphere hath been commonly aſcribed to a repulſion between its particles; but this can give us only a very ſlight idea of the nature of its elaſticity. The term *repulſion*, like that of *attraction*, requires to be defined; and in all probability will be found in moſt caſes to be the effect of the action of ſome other fluid. Thus, we find, that the elaſticity of the atmoſphere is very conſiderably affected by heat. Suppoſing a quantity of air heated to ſuch a degree as is ſufficient to raiſe Fahrenheit's thermometer to 212, it will then occupy a conſiderable ſpace. If it is cooled to ſuch a degree as to ſink the thermometer to 0, it will ſhrink up into leſs than half the former bulk. The quantity of repulſive power therefore acquired by the air, while paſſing from one of theſe ſtates to the other, is evidently owing to the heat added to or taken away from it. Nor have we any reaſon to ſuppoſe, that the quantity of elaſticity or repulſive power it ſtill poſſeſſes is owing to any other thing than the fire contained in it. The ſuppoſing repulſion to be a primary cauſe independent of all others, hath given riſe to many erroneous theories, and been one very great mean of embarraſſing philoſophers in their accounting for the phenomena of ELECTRICITY.

ELATE, in botany, a genus belonging to the natural order of *Palmæ*. There is no male calyx; the corolla is tripetalous, with three ſtamina. There is no female calyx; the corolla is tripetalous, with one piſtil; the fruit is an oval acuminated plum.

Plate CLXX

ELATER, in zoology; a genus of inſects, belonging to the order of coleoptera. The antennæ are ſetaceous; and an elaſtic ſpring or ſpine projects from the hinder extremity of the breaſt or under ſide of the thorax. By means of this kind of ſpring, the animal, when turned upon his back, contrives to leap up into the air, and ſo turn itſelf. It varies in ſize; and when the inſect is young and newly metamorphoſed, its elytra are of a beautiful deep red; but in a few days they change to a much darker hue, and are nearly of a cheſnut colour. In the ſtate of larvæ it inhabits the trunks of decayed trees, and is there transformed. With the help of its wings it iſſues from its priſon, flutters upon flowers, wanders over the fields, and conceals itſelf in thickets or under the bark of trees.

ELATERIUM, in botany: A genus of the monandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 34th order, *Cucurbitaceæ*. There is no male calyx; the corolla is ſalver-ſhaped; there is no female calyx; the corolla ſalver-ſhaped; the capſule inferior, unilocular, and bivalved.

ELATERIUM, Ελατηριον, in pharmacy, a violently purgative

gative medicine, prepared from the wild cucumber.

ELATH, or Eloth, a part of Idumæa, ſituated upon the Red Sea, which David in his conqueſt of Edom took (2 Sam. viii. 14.), and there eſtabliſhed a trade to all parts of the world. His ſon, we ſee, built ſhips in Elath, and ſent them from thence to Ophir for gold, 2 Chr. viii. 17, 18. It continued in the poſſeſſion of the Iſraelites about 150 years, till in the time of Joram, the Edomites recovered it (2 Kings viii. 20.); but it was again taken from them by Azariah, and by him left to his ſon, 2 Kings xiv. 22. His grandſon Ahaz, however, loſt it again to the king of Syria (*ib.* xvi. 6.); and the Syrians had it in their hands a long while, till after many changes under the Ptolemies, it came at length into the poſſeſſion of the Romans.

ELATINE, in botany: A genus of the tetragynia order, belonging to the octandria claſs of plants; and in the natural method ranking under the 15th order, *Inundatæ*. The calyx is tetraphyllous; the petals four; the capſule quadrilocular, quadrivalved, and depreſſed.

ELATOSTEMA, in botany: A genus of the pentandria order, belonging to the monœcia claſs of plants. The male flowers have no calyx; the corolla is quinquepartite; the ſtamina are five filaments. There are female flowers on the ſame plant; theſe have no calyx nor corolla; the pericarpium is a very ſmall oblong, bivalve, monoſpermous capſule; the ſeeds ſingle and egg-ſhaped.

ELBE, a large river in Germany, which, riſing on the confines of Sileſia, runs through Bohemia, Saxony, and Brandenburg; and afterwards dividing the duchy of Luxenburg from that of Mecklenburg, as alſo the duchy of Bremen from Holſtein, it falls into the German ocean, about 70 miles below Hamburg. It is navigable for great ſhips higher than any river in Europe.

ELBING, a city of Poliſh Pruſſia, in the palatinate of Marienburg, ſituated in E. Long. 20. 0. N. Lat. 54 15, on a bay of the Baltic ſea, called the *Friſchaff*, near the mouth of the Viſtula. The town is large, populous, and very well built. It is divided into two parts, called the old and new town, which are both of them very well fortified. The old town has a handſome tower, with a good college. The ſtadthouſe and the academy are good buildings, with pleaſant gardens, which are worth ſeeing. The place has a conſiderable trade, eſpecially in ſturgeon, mead, cheeſe, butter, and corn. It is ſeated in a champaign level like Holland, very fruitful and populous. The inhabitants are partly Lutherans and partly Roman Catholics. The Boors in the neighbourhood have as good houſes and apparel almoſt as the nobility of Courland.

ELBOW, the outer angle made by the flexure or bend of the arm. That eminence whereon the arm reſts, called by us *elbow*, is by the Latins called *cubitus*, and the Greeks αγκων, and by others ολεκρανον.

Elbow is alſo uſed by architects, maſons, &c. for an obtuſe angle of a wall, building, or road, which diverts it from its right line.

ELCESAITES, in church-hiſtory, ancient heretics, who made their appearance in the reign of the emperor Trajan, and took their name from their leader Elceſai. The Elceſaites kept a mean between the Jews, Chriſtians, and Pagans; they worſhipped but one God, obſerved the Jewiſh ſabbath, circumciſion, and the other ceremonies of the law. They rejected the Pentateuch, and the prophets; nor had they any more reſpect for the writings of the apoſtles, particularly thoſe of St Paul.

ELDERS, or Seniors, in Jewiſh hiſtory, were perſons the moſt conſiderable for age, experience, and wiſdom. Of this ſort were the 70 men whom Moſes aſſociated to himſelf in the government of his people; ſuch, likewiſe, afterwards were thoſe who held the firſt mark in the ſynagogue, as preſidents.

In the firſt aſſemblies of the primitive Chriſtians, thoſe who held the firſt place were called *elders*. The word *preſbyter*, often uſed in the New Teſtament, is of the ſame ſignification: hence the firſt councils of Chriſtians were called *preſbyteria*, or *councils of elders*.

Elders is alſo a denomination ſtill retained in the Preſbyterian diſcipline. The elders are officers, who, in conjunction with the paſtors, or miniſters, and deacons, compoſe the conſiſtories or kirk-ſeſſions, meeting to conſider, inſpect, and regulate, matters of religion and diſcipline. They are choſen from among the people, and are received publicly with ſome degree of ceremony. In Scotland, there is an indefinite number of elders in each pariſh; generally about 12. See *Kirk-Seſſions*, and Presbytery.

Elder, in botany. See Sambucus.

ELEA, or Elis, (anc. geog.), a diſtrict of Peloponneſus, ſituated between Achaia and Meſſenia, reaching from Arcadia quite to the weſt or Ionian ſea: ſo called from Elis, a cognominal town. See Elis.

ELEATIC philosophy, among the ancients; a name given to that of the stoics, becauſe taught at 'Ελεα. in Latin *Velia*, a town of the Lucani.

The founder of this philoſophy, or of the Eleatic ſect, is ſuppoſed to have been Xenophanes, who lived about the 56th Olympiad, or between 500 or 600 years before Chriſt. This ſect was divided into two parties, which may be denominated *metaphyſical* and *phyſical*; the one rejecting, and the other approving, the appeal to fact and experiment. Of the former kind were Xenophanes, Parmenides, Meliſſus, and Zeno, of Elea. They are ſuppoſed to have maintained principles not very unlike thoſe of Spinoza; they held the eternity and immutability of the world; that whatever exiſted was only one being; that there was neither any generation nor corruption; that this one being was immoveable and immutable, and was the true God; and whatever changes ſeemed to happen in the univerſe, they conſidered as mere appearances and illuſions of ſenſe. However, ſome learned men have ſuppoſed, that Xenophanes and his followers, ſpeaking metaphyſically, underſtood by the univerſe, or the one being, not the material world, but the originating principle of all things, or the true God, whom they expreſsly affirm to be incorporeal. Thus Simplicius repreſents them as merely metaphyſical writers, who diſtinguiſhed between things natural and ſupernatural; and who made the former to be compounded of different principles. Accordingly, Xenophanes maintained, that the earth conſiſted of air and fire, that all things were produced out of the earth, and the ſun and ſtars out of clouds, and that there were four elements. Parmenides

menides alſo diſtinguiſhed between the doctrine concerning metaphyſical objects, called *truth*, and that concerning phyſical or corporeal things, called *opinion*; with reſpect to the former there was one immoveable principle, but in the latter two that were moveable, viz. fire and earth, or heat and cold; in which particulars Zeno agreed with him. The other branch of the Eleatic ſect were the atomic philoſophers, who formed their ſyſtem from an attention to the phenomena of nature; of theſe the moſt conſiderable were Leucippus, Democritus, and Protagoras.

ELECAMPANE, in botany. See INULA.

ELECT, (from *eligo*, "I chooſe") CHOSEN, in the Scriptures, is applied to the primitive Chriſtians; in which ſenſe, the elect are thoſe choſen and admitted to the favour and bleſſing of Chriſtianity.

ELECT, in ſome ſyſtems of theology, is a term appropriated to the ſaints, or the predeſtinated: in which ſenſe the elect are thoſe perſons who are ſaid to be predeſtinated to glory as the end, and to ſanctification as the means.

ELECT is likewiſe applied to archbiſhops, biſhops, and other officers, who are choſen, but not yet conſecrated, or actually inveſted with their office or juriſdiction.

The emperor is ſaid to be elect before he is inaugurated and crowned; a lord-mayor is elect, before his predeceſſor's mayoralty is expired, or the ſword is put in his hands.

ELECTION, the choice that is made of any thing or perſon, whereby it is preferred to ſome other. There ſeems this difference, however, between choice and election, that election has uſually a regard to a company or community, which makes the choice; whereas choice is ſeldom uſed but when a ſingle perſon makes it.

ELECTION, in Britiſh polity, is the people's choice of their repreſentatives in parliament. (See PARLIAMENT.) In this conſiſts the exerciſe of the democratical part of our conſtitution: for in a democracy there can be no exerciſe of ſovereignty but by ſuffrage, which is the declaration of the people's will. In all democracies, therefore, it is of the utmoſt importance to regulate by whom, and in what manner, the ſuffrages are to be given. And the Athenians were ſo juſtly jealous of this prerogative, that a ſtranger, who interfered in the aſſemblies of the people, was puniſhed by their laws with death; becauſe ſuch a man was eſteemed guilty of high treaſon, by uſurping thoſe rights of ſovereignty to which he had no title. In Britain, where the people do not debate in a collective body, but by repreſentation, the exerciſe of this ſovereignty conſiſts in the choice of repreſentatives. The laws have therefore very ſtrictly guarded againſt uſurpation or abuſe of this power, by many ſalutary proviſions; which may be reduced to theſe three points, 1. The qualifications of the electors. 2. The qualifications of the elected. 3. The proceedings at elections.

*Blackſt. Comment.*

(1.) As to the qualifications of the electors. The true reaſon of requiring any qualification, with regard to property, in voters, is to exclude ſuch perſons as are in ſo mean a ſituation, that they are eſteemed to have no will of their own. If theſe perſons had votes, they would be tempted to diſpoſe of them under ſome undue influence or other. This would give a great, an artful, or a wealthy man, a larger ſhare in elections than is conſiſtent with general liberty. If it were probable that every man would give his vote freely, and without influence of any kind: then, upon the true theory and genuine principles of liberty, every member of the community, however poor, ſhould have a vote in electing thoſe delegates to whoſe charge is committed the diſpoſal of his property, his liberty, and his life. But ſince that can hardly be expected in perſons of indigent fortunes, or ſuch as are under the immediate dominion of others, all popular ſtates have been obliged to eſtabliſh certain qualifications; whereby ſome, who are ſuſpected to have no will of their own, are excluded from voting, in order to ſet other individuals, whoſe will may be ſuppoſed independent, more thoroughly upon a level with each other.

And this conſtitution of ſuffrages is framed upon a wiſer principle, with us, than either of the methods of voting, by centuries or by tribes, among the Romans. In the method by centuries, inſtituted by Servius Tullius, it was principally property, and not numbers, that turned the ſcale: in the method by tribes, gradually introduced by the tribunes of the people, numbers only were regarded, and property entirely overlooked. Hence the laws paſſed by the former method had uſually too great a tendency to aggrandize the patricians or rich nobles: and thoſe by the latter had too much of a levelling principle. Our conſtitution ſteers between the two extremes. Only ſuch are entirely excluded as can have no will of their own: there is hardly a free agent to be found, but what is intitled to a vote in ſome place or other in the kingdom. Nor is comparative wealth, or property, entirely diſregarded in elections; for though the richeſt man has only one vote at one place, yet, if his property be at all diffuſed, he has probably a right to vote at more places than one, and therefore has many repreſentatives. This is the ſpirit of our conſtitution: not that we aſſert it is in fact quite ſo perfect as we have endeavoured to deſcribe it; for if any alteration might be wiſhed or ſuggeſted in the preſent form of parliaments, it ſhould be in favour of a more complete repreſentation of the people.

But to return to the qualifications; and firſt thoſe of electors for knights of the ſhire. 1. By ſtatute 8 Hen. VI. c. 7. and 10 Hen. VI. c. 2. (amended by 14 Geo. III. c. 58.) the knights of the ſhire ſhall be choſen of people, whereof every man ſhall have freehold to the value of forty ſhillings by the year within the county; which (by ſubſequent ſtatutes) is to be clear of all charges and deductions, except parliamentary and parochial taxes. The knights of ſhires are the repreſentatives of the landholders, or landed intereſt of the kingdom: their electors muſt therefore have eſtates in lands or tenements within the county repreſented. Theſe eſtates muſt be freehold, that is, for term of life at leaſt; becauſe beneficial leaſes for long terms of years were not in uſe at the making of theſe ſtatutes, and copyholders were then little better than villeins, abſolutely dependent upon their lords. This freehold muſt be of 40 ſhillings annual value; becauſe that ſum would then, with proper induſtry, furniſh all the neceſſaries of life, and render the freeholder, if he pleaſed, an independent man: For biſhop Fleetwood, in his *chronicon precioſum*, written at the beginning of the preſent century, has fully proved 40 ſhillings in the reign of Henry VI. to have been equal to 12 pounds *per annum* in the reign of Queen Anne; and, as the value of money is very conſiderably lowered ſince the biſhop wrote, we may fairly conclude, from this and other circumſtances, that what was equivalent to 12 pounds in his days, is equivalent to 20 at preſent. The other leſs important qualifications of the electors for counties in England and Wales may be collected from the ſtatutes cited below (A); which direct, 2. That no perſon under 21 years of age ſhall be capable of voting for any member. This extends to all ſorts of members as well for boroughs as counties; as does alſo the next, *viz.* 3. That no perſon convicted of perjury, or ſubornation of perjury, ſhall be capable of voting in any election. 4. That no perſon ſhall vote in right of any freehold, granted to him fraudulently to qualify him to vote. Fraudulent grants are ſuch as contain an agreement to reconvey, or to defeat the eſtate granted; which agreements are made void, and the eſtate is abſolutely veſted in the perſon to whom it is ſo granted. And, to guard the better againſt ſuch frauds, it is farther provided, 5. That every voter ſhall have been in the actual poſſeſſion, or receipt of the profits, of his freehold to his own uſe for 12 kalendar months before; except it came to him by deſcent, marriage, marriage-ſettlement, will, or promotion to a benefice or office. 6. That no perſon ſhall vote in reſpect of an annuity or rent-charge, unleſs regiſtered with the clerk of the peace 12 kalendar months before. 7. That in mortgaged or truſt-eſtates, the perſon in poſſeſſion, under the abovementioned reſtrictions, ſhall have the vote. 8. That only one perſon ſhall be admitted to vote for any one houſe or tenement, to prevent the ſplitting of freeholds. 9. That no eſtate ſhall qualify a voter, unleſs the eſtate has been aſſeſſed to ſome land-tax aid, at leaſt 12 months before the election. 10. That no tenant by copy of court-roll ſhall be permitted to vote as a freeholder. Thus much for the electors in counties.

As for the electors of citizens and burgeſſes, theſe are ſuppoſed to be the mercantile part or trading intereſt of this kingdom. But as trade is of a fluctuating nature, and ſeldom long fixed in a place, it was formerly left to the crown to ſummon, *pro re nata*, the moſt flouriſhing towns to ſend repreſentatives to parliament. So that as towns increaſed in trade, and grew populous, they were admitted to a ſhare in the legiſlature. But the misfortune is, that the deſerted boroughs continued to be ſummoned, as well as thoſe to whom their trade and inhabitants were transferred; except a few which petitioned to be eaſed of the expence, then uſual, of maintaining their members: four ſhillings a-day being allowed for a knight of the ſhire, and two ſhillings for a citizen or burgeſs; which was the rate of wages eſtabliſhed in the reign of Edward III. Hence the members for boroughs now bear above a quadruple proportion to thoſe for counties; and the number of parliament men is increaſed ſince Forteſcue's time, in the reign of Henry VI. from 300 to upwards of 500, excluſive of thoſe for Scotland. The univerſities were, in general, not empowered to ſend burgeſſes to parliament; though once, in 28 Edw. I. when a parliament was ſummoned to conſider of the king's right to Scotland, there were iſſued writs, which required the univerſity of Oxford to ſend up four or five, and that of Cambridge two or three, of their moſt diſcreet and learned lawyers for that purpoſe. But it was king James I. who indulged them with the permanent privilege to ſend conſtantly two of their own body; to ſerve for thoſe ſtudents who, though uſeful members of the community, were neither concerned in the landed nor the trading intereſt; and to protect in the legiſlature the rights of the republic of letters. The right of election in boroughs is various, depending entirely on the ſeveral charters, cuſtoms, and conſtitutions of the reſpective places; which has occaſioned infinite diſputes: tho' now, by ſtatute 2 Geo. II. c. 24. the right of voting for the future ſhall be allowed according to the laſt determination of the houſe of commons concerning it; and, by ſtatute 3 Geo. III. c. 15. no freeman of any city or borough (other than ſuch as claim by birth, marriage, or ſervitude) ſhall be intitled to vote therein, unleſs he hath been admitted to his freedom 12 kalendar months before.

(2) Next, as to the qualifications of perſons to be *elected* members of the houſe of commons. Some of theſe depend upon the law and cuſtom of parliaments, declared by the houſe of commons; others upon certain ſtatutes. And from theſe it appears, 1. That they muſt not be aliens born or minors. 2. That they muſt not be any of the 12 judges, becauſe they ſit in the lords' houſe; nor of the clergy, for they ſit in the convocation; nor perſons attainted of treaſon, or felony, for they are unfit to ſit any where. 3. That ſheriffs of counties, and mayors and bailiffs of boroughs, are not eligible in their reſpective juriſdictions, as being returning officers; but that ſheriffs of one county are eligible to be knights of another. 4. That, in ſtrictneſs, all members ought to have been inhabitants of the places for which they are choſen; but this, having been long diſregarded, was at length entirely repealed by ſtatute 14 Geo. III. c. 58. 5. That no perſons concerned in the management of any duties or taxes created ſince 1692, except the commiſſioners of the treaſury, nor any of the officers following (viz. commiſſioners of prizes, tranſports, ſick and wounded, wine-licences, navy, and victualling; ſecretaries or receivers of prizes; comptrollers of the army-accounts; agents for regiments; governors of plantations, and their deputies; officers of Minorca or Gibraltar; officers of the exciſe and cuſtoms; clerks or deputies in the ſeveral offices of the treaſury, exchequer, navy, victualling, admiralty, pay of the army or navy, ſecretaries of ſtate, ſalt, ſtamps, appeals, wine-licences, hackney-coaches, hawkers, and pedlars), nor any perſons that hold any new office under the crown created ſince 1705, are capable of being elected or ſitting as members. 6. That no perſon having a penſion under the crown during pleaſure, or for any term of years, is capable of being elected or ſitting. 7. That if any mem-

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(A) 7 and 8 Will. III. c. 25. 10 Ann. c. 23. 2 Geo. II. c. 21. 18 Geo. II. c. 18. 31 Geo. II. c. 14. 3 Geo. III. c. 24.

member accepts an office under the crown, except an officer in the army or navy accepting a new commiſſion, his ſeat is void; but ſuch member is capable of being re-elected. 8. That all knights of the ſhire ſhall be actual knights, or ſuch notable eſquires and gentlemen as have eſtates ſufficient to be knights, and by no means of the degree of yeomen. This is reduced to a ſtill greater certainty, by ordaining, 9. That every knight of a ſhire ſhall have a clear eſtate of freehold or copyhold to the value of 600 l. *per annum*, and every citizen and burgeſs to the value of 300 l.: except the eldeſt ſons of peers and of perſons qualified to be knights of ſhires, and except the members for the two univerſities: which ſomewhat balances the aſcendant which the boroughs have gained over the counties, by obliging the trading intereſt to make choice of landed men: and of this qualification the member muſt make oath, and give in the particulars in writing, at the time of his taking his ſeat. But, ſubject to theſe ſtanding reſtrictions and diſqualifications, every ſubject of the realm is eligible of common right: though there are inſtances, wherein perſons in particular circumſtances have forfeited that common right, and have been declared ineligible *for that parliament*, by a vote of the houſe of commons; or *for ever*, by an act of the legiſlature. But it was an unconſtitutional prohibition, which was grounded on an ordinance of the houſe of *lords*, and inſerted in the *king's* writs, for the parliament holden at Coventry, 6 Hen. IV. that no apprentice or other man of the law ſhould be elected a knight for the ſhire therein: in return for which, our law-books and hiſtorians have branded this parliament with the name of *parliamentum indoctum*, or the lack-learning parliament; and Sir Edward Coke obſerves with ſome ſpleen, that there was never a good law made thereat.

(3.) The third point, regarding elections, is the method of proceeding therein. This is alſo regulated by the law of parliament, and the ſeveral ſtatutes referred to in the margin below, (B); all which we ſhall blend together, and extract out of them a ſummary account of the method of proceeding to elections.

As ſoon as the parliament is ſummoned, the lord chancellor (or if a vacancy happens during the ſitting of parliament, the ſpeaker, by order of the houſe, and without ſuch order if a vacancy happens by death in the time of a receſs for upwards of 20 days) ſends his warrant to the clerk of the crown in chancery; who thereupon iſſues out writs to the ſheriff of every county, for the election of all the members to ſerve for that county, and every city and borough therein. Within three days after the receipt of this writ, the ſheriff is to ſend his precept, under his ſeal, to the proper returning officers of the cities and boroughs, commanding them to elect their members: and the ſaid returning officers are to proceed to election within eight days from the receipt of the precept, giving four days notice of the ſame; and to return the perſons choſen, together with the precept, to the ſheriff.

But elections of knights of the ſhire muſt be proceeded to by the ſheriffs themſelves in perſon, at the next county-court that ſhall happen after the delivery of the writ. The county-court is a court held every month or oftener by the ſheriff, intended to try little cauſes not exceeding the value of 40 s. in what part of the county he pleaſes to appoint for that purpoſe: but for the election of knights of the ſhire, it muſt be held at the moſt uſual place. If the county-court falls upon the day of delivering the writ, or within ſix days after, the ſheriff may adjourn the court and election to ſome other convenient time, not longer than 16 days, nor ſhorter than 10; but he cannot alter the place, without the conſent of all the candidates: and, in all ſuch caſes, 10 days public notice muſt be given of the time and place of the election.

And, as it is eſſential to the very being of parliament that elections ſhould be abſolutely free, therefore all undue influences upon the electors are illegal, and ſtrongly prohibited. For Mr Locke ranks it among thoſe breaches of truſt in the executive magiſtrate, which, according to his notions, amount to a diſſolution of the government, "if he employs the force, treaſure, and offices of the ſociety to corrupt the repreſentatives, or openly to pre-engage the electors, and preſcribe what manner of perſons ſhall be choſen: For thus to regulate candidates and electors, and new-model the ways of election, what is it (ſays he) but to cut up the government by the roots and poiſon the very fountain of public ſecurity?" As ſoon, therefore, as the time and place of election, either in counties or boroughs, are fixed, all ſoldiers quartered in the place are to remove, at leaſt one day before the election, to the diſtance of two miles or more; and not to return till one day after the poll is ended. Riots likewiſe have been frequently determined to make an election void. By vote alſo of the houſe of commons, to whom alone belongs the power of determining conteſted elections, no lord of parliament, or lord lieutenant of a county, hath any right to interfere in the election of commoners; and, by ſtatute, the lord warden of the cinque-ports ſhall not recommend any members there. If any officer of the exciſe, cuſtoms, ſtamps, or certain other branches of the revenue, preſumes to intermeddle in elections, by perſuading any voter or diſſuading him, he forfeits L. 100, and is diſabled to hold any office.

Thus are the electors of one branch of the legiſlature ſecured from any undue influence from either of the other two, and from all external violence and compulſion. But the greateſt danger is that in which themſelves co-operate, by the infamous practice of bribery and corruption. To prevent which it is enacted, that no candidate ſhall, after the date (uſually called the *teſte*) of the writs, or after the vacancy, give any money or entertainment to his electors, or promiſe to give any, either to particular perſons, or to the place in general, in order to his being elected;

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(B) 7 Hen. IV. c. 15. 8 Hen. 6. c. 7. 23 Hen. VI. c. 14. 1 W. & M. ſt. 1. c. 2. 2 W. & M. ſt. 1. c. 7. 5 & 6 W. & M. c. 20. 7 W. III. c. 4. 7 & 8 W. III. c. 7. and c. 25. 10 & 11 W. III. c. 7. 12 & 13 W. III. c. 10. 6 Ann. c. 23. 9 Ann. c. 5. 10 Ann. c. 19. and c. 33. 2 Geo. II. c. 24. 8 Geo. II. c. 30. 18 Geo. II. c. 18. 19 Geo. II. c. 28. 10 Geo. III. c. 16. 11 Geo. III. c. 42. 14 Geo. III. c. 15.

on pain of being incapable to ſerve for that place in parliament. And if any money, gift, office, employment, or reward be given, or promiſed to be given, to any voter, at any time, in order to influence him to give or with-hold his vote, as well he that takes as he that offers ſuch bribe forfeits L. 500, and is for ever diſabled from voting and holding any office in any corporation; unleſs, before conviction, he will diſcover ſome other offender of the ſame kind, and then he is indemnified for his own offence. The firſt inſtance that occurs of election bribery, was ſo early as 13 Eliz. when one Thomas Longe (being a ſimple man, and of ſmall capacity to ſerve in parliament) acknowledged that he had given the returning officer and others of the borough for which he was choſen four pounds to be returned member, and was for that premium elected. But for this offence the borough was amerced, the member was removed, and the officer fined and impriſoned. But as this practice hath ſince taken much deeper and more univerſal root, it hath occaſioned the making of theſe wholeſome ſtatutes; to complete the efficacy of which, there is nothing wanting but reſolution and integrity to put them in ſtrict execution.

Undue influence being thus guarded againſt, the election is to be proceeded to on the day appointed; the ſheriff or other returning officer firſt taking an oath againſt bribery, and for the due execution of his office. The candidates likewiſe, if required, muſt ſwear to their qualification, and the electors in counties to theirs; and the electors both in counties and boroughs are alſo compellable to take the oath of abjuration, and that againſt bribery and corruption. And it might not be amiſs, if the members elected were bound to take the latter oath as well as the former; which, in all probability, would be much more effectual than adminiſtering it only to the electors.

The election being cloſed, the returning officer in boroughs returns his precept to the ſheriff, with the perſons elected by the majority: and the ſheriff returns the whole, together with the writ for the county and the knights elected thereupon, to the clerk of the crown in chancery; before the day of meeting, if it be a new parliament, or within 14 days after the election, if it be an occaſional vacancy; and this under penalty of L. 500. If the ſheriff does not return ſuch knights only as are duly elected, he forfeits, by the old ſtatutes of Henry VI. L. 100; and the returning officer in boroughs, for a like falſe return, L. 40; and they are beſides liable to an action, in which double damages ſhall be recovered, by the later ſtatutes of king William: and any perſon bribing the returning officer ſhall alſo forfeit L. 300. But the members returned by him are the ſitting members, until the houſe of commons, upon petition, ſhall adjudge the return to be falſe and illegal. The form and manner of proceeding upon ſuch petition are now regulated by ſtatute 10 Geo. III. c. 16. (amended by 11 Geo. III. c. 42. and made perpetual by 14 Geo. III. c. 15.), which directs the method of chooſing by lot a ſelect committee of 15 members, who are ſworn well and truly to try the ſame, and a true judgment to give, according to the evidence.

*Election of Scots Peers.* See Lords.

*Election of Eccleſiaſtical Perſons.* Elections for the dignities of the church ought to be free, according to the ſtat. 9 Ed. II. cap. 14. If any perſons, that have a voice in elections, take any reward for an election in any church, college, ſchool, &c. the election ſhall be void. And if any perſons of ſuch ſocieties reſign their places to others for reward, they incur a forfeiture of double the ſum; and both the parties are rendered incapable of the place. Stat. 31 Eliz. cap. 6.

*Election of a Verderor of the Foreſt (electione viridariorum foreſtæ)*, in law, a writ that lies for the choice of a verderor, where any of the verderors of the foreſt are dead, or removed from their offices. This writ is directed to the ſheriff, and the verderor is to be elected by the freeholders of the county, in the ſame manner as coroners. New. Nat. Brev. 366.

Election is alſo the ſtate of a perſon who is left to his own free will, to take or do either one thing or another, which he pleaſes. See Liberty.

Election, in theology, ſignifies the choice which God, of his good pleaſure, makes of angels or men, for the objects of mercy and grace.

The election of the Jews was the choice God made of that people to be more immediately attached to his worſhip and ſervice, and for the Meſſiah to be born of them. And thus particular nations were elected to the participation of the outward bleſſings of Chriſtianity.

Election alſo, in the language of ſome divines, ſignifies a predeſtination to grace and glory, and ſometimes to glory only. And it has been enjoined as an article of faith, that predeſtination to grace is gratuitous, merely and ſimply ſo; *gratia, quia gratis data.* But the divines are much divided as to the point, whether election to glory be gratuitous, or whether it ſuppoſes obedience and good works, *i. e.* whether it be before or after the proviſion of our obedience. See Grace, and Reprobation.

ELECTIVE, ſomething that is done, or paſſes, by election. See Elector.

Some benefices are elective, others collative. Municipal offices in England are generally elective; in Spain, venal. Poland is an elective kingdom.

*Elective Attraction.* See *Chemistry-Index.*

ELECTOR, a perſon who has a right to elect or chooſe another to an office, honour, &c. See Election.

Elector is particularly, and by way of eminence, applied to thoſe princes of Germany in whom lies the right of electing the emperor; being all ſovereign princes, and the principal members of the empire.

The electoral college, conſiſting of all the electors of the empire, is the moſt illuſtrious and auguſt body in Europe. Bellarmine and Baronius attribute the inſtitution of it to pope Gregory V. and the emperor Otho III. in the tenth century; of which opinion are the generality of hiſtorians, and particularly the canoniſts: however, the number of electors was unſettled, at leaſt, till the 13th century. In 1356 Charles IV. by the golden bull, fixed the number of electors to ſeven; three eccleſiaſtics, *viz.* the archbiſhops of Mentz, Treves, and Cologne; and four ſeculars, viz. the king of Bohemia, count Palatine of the Rhine, duke of Saxony, and marquis of Brandenburg. In 1648 this order was changed, the duke of Bavaria being put in the place of the count Palatine, who having accepted the crown of Bohemia was outlawed by the emperor;

but being at length reſtored, an eight electorate was erected for the duke of Bavaria. In 1692, a ninth electorate was created, by the emperor Leopold, in favour of the duke of Hanover, of the houſe of Brunſwic Lunenburg.

There is this difference between the ſecular and eccleſiaſtical electors, that the firſt have an active and paſſive voice, that is, may chooſe and be choſen; the laſt, an active only. The three archbiſhops are to be 30 years old, before they can be advanced to the dignity; the ſeculars, 18, before they can perform the office themſelves. Theſe laſt have each their vicars, who officiate in their abſence.

Beſides the power of chooſing an emperor, the electors have alſo that of capitulating with and depoſing him; ſo that, if there be one ſuffrage wanting, a proteſt may be entered againſt the proceedings. By the right of capitulation, they attribute to themſelves great privileges, as making of war, coining, and taking care of the public intereſt and ſecurity of the ſtates; and the emperor promiſes, upon oath, to receive the empire upon theſe conditions.

The electors have precedence of all other princes of the empire, even of cardinals and kings; and are addreſſed under the title of *electoral highneſs*.

Their ſeveral functions are as follow. The elector of Mentz is chancellor of Germany, convokes the ſtates, and gives his vote before any of the reſt. The elector of Cologne is grand chancellor of Italy, and conſecrates the emperor. The elector of Treves is chancellor of the Gauls, and confers impoſition of hands upon the emperor. The count Palatine of the Rhine is great treaſurer of the empire, and preſents the emperor with a globe at his coronation. The elector of Bavaria is great maſter of the imperial palace, and carries the golden apple. The marquis of Brandenburgh is grand chamberlain, and puts the ring on the emperor's finger. The elector of Saxony is grand marſhal, and gives the ſword to the emperor. The king of Bohemia is grand butler, and puts Charlemagne's crown on the emperor's head. Laſtly, the elector of Hanover, now king of Great Britain, is arch-treaſurer, tho' firſt erected under the title of *ſtandard-bearer* of the empire.

ELECTORATE, a term uſed as well to ſignify the dignity of, as the territories belonging to, any of the electors of Germany; ſuch are Bavaria, Saxony, &c. See ELECTOR.

ELECTRIC, derived from ηλεκτρον, "amber," in phyſics, is a term applied to thoſe ſubſtances, in which the electric fluid is capable of being excited, and accumulated without tranſmitting it, and therefore called *non-conductors*. See ELECTRICITY.

# ELECTRICITY,

IN general, ſignifies the operations of a very ſubtile fluid, in moſt caſes inviſible, but which ſometimes becomes the object of our ſight and other ſenſes, diſcovering itſelf to be one of the chief agents employed in producing the phenomena of nature.

## SECT. I. *Definitions of Terms uſed in the Science.*

BEFORE we can enter upon this ſcience with propriety, even ſo far as to give an hiſtory of its riſe and progreſs, it ſeems neceſſary to give ſome explanation of the terms made uſe of by writers on electricity, that the reader may not be embarraſſed with words whoſe meaning he cannot perhaps eaſily comprehend.

1. The foundation of all that is known upon this ſubject, is the difference between electric bodies and ſuch as are not. The former may generally be diſtinguiſhed by their attracting and repelling light ſubſtances, which the latter cannot be made to do. The principal electric bodies are glaſs, amber, ſealing-wax, gum-lac, ſulphur, roſin, &c. They are often called *non-conductors*, or *electrics per ſe*.

2. The uſual way in which the electric power of any body can be diſcovered, is by rubbing it with ſome ſoft ſubſtance, generally woollen, ſilk, or fur; and, according to the ſtrength of the electric virtue, the former body will attract and repel light ſubſtances preſented to it at a greater or leſs diſtance. If the virtue is very ſtrong, the electric body will emit ſparks, or even ſtrong flaſhes of fire, to a conſiderable diſtance. In ſome caſes electricity diſcovers itſelf by heating the body, or blowing air upon it; but in both theſe ways it is much weaker than that produced by rubbing. In whatever way this power is made to ſhow itſelf, the ſubſtance poſſeſſed of it is ſaid to be *excited*.

3. *Conductors*, called alſo *non-electrics*, are ſuch ſubſtances as, though incapable of being excited, can yet in certain circumſtances convey the electric power from one body to another, and that to any imaginable diſtance. The beſt conductors are metals of all kinds, charcoal, and water.

4. Electrics, we have already obſerved, are alſo called *non-conductors*; and this name they have from their power of ſtopping the communication of the electric virtue from one body to another. Thus, though any conductor be placed properly for receiving the virtue from an excited electric, none will paſs to it if any electric ſubſtance be interpoſed; or, if the conductor be terminated by an electric, none will paſs beyond the place where the electric ſubſtance begins.

5. Inſulation is when a conducting ſubſtance is placed upon an electric, ſo that any power communicated to it cannot paſs off. It muſt be remembered, however, that all this is to be underſtood with ſome degree of limitation; for there is no ſubſtance either a perfect electric, or a perfect conductor; the beſt conductors making a ſenſible reſiſtance to the paſſage of the fluid through them when they are very long; and the moſt perfect electrics tranſmitting ſome of the fluid over, or through them. Indeed, though theſe two different kinds of ſubſtances ſeem to be ſo far removed from one another, they in reality approach to a ſurpriſing degree, inſomuch that there are many ſubſtances which can be excited as electrics, and yet have a very conſiderable conducting power.

6. The effects of the electric fluid diſcovering them-

ſelves either by attraction and repulſion, or by emitting ſtreams, or pencils as they are called, of blue light, are all claſſed under the general word *electricity;* and any body to which that power of attraction and repulſion, &c. is communicated, is ſaid to be *electrified*. If its virtue is inherent in itſelf, it is ſaid to be *excited*.

7. Electricity is found to be of two kinds; the one called *negative*, and the other *poſitive*. It is uncertain in what the difference betwixt theſe two conſiſts. Dr Franklin is of opinion that the former conſiſts in a ſuperabundance of the fluid, or when more is thrown upon any ſubſtance than it can conveniently contain; the other, when a part of it is abſtracted, and the body contains leſs than it naturally ought to do. Other theoriſts ſuppoſe, that when the fluid is directed outwards from any ſubſtance, that ſubſtance will in all caſes be electrified poſitively; and that when the fluid is either entering or has a tendency to enter into any ſubſtance, it will then be electrified negatively. This queſtion will be diſcuſſed in the courſe of the treatiſe.—The moſt remarkable differences we can perceive between the poſitive and negative electricities are that they attract each other, though ſtrongly repulſive of themſelves; that is, two bodies poſitively electrified, or negatively electrified, repel each other; but one body poſitively electrified will attract another negatively ſo; and if the electricities are very ſtrong, a ſpark will be obſerved between them at meeting. Theſe electricities are produced naturally by exciting different ſubſtances, or by uſing a different rubber to the ſame ſubſtance. Thus, glaſs uſually produces the poſitive electricity; but by uſing a certain kind of rubber, or altering the ſmoothneſs of its ſurface, it may be made to produce the negative kind. The two electricities are ſometimes called the *vitreous* and *reſinous*, as well as poſitive and negative.

## SECT. II. *Hiſtory of Electricity.*

1
ricity
firſt
ioned.

THOUGH it is certain that, ever ſince the creation of the world, the fluid we ſpeak of hath had the ſame ſhare in all the natural operations that it hath juſt now; yet the diſcovery of its action, and even of its exiſtence, is, comparatively ſpeaking, of a very late date. Thales the Mileſian, who lived about 600 years before Chriſt, was the firſt that obſerved the electrical properties of amber. Of theſe, indeed, he knew no more than that this ſubſtance would attract light bodies when it was rubbed. For 300 years after his time, we hear nothing farther concerning this ſubject. Theophraſtus then tells us, that the *lyncurium* (the ſame ſubſtance now called the *tourmalin)*, has the property of attracting light bodies, as well as amber. From this time, there is a chaſm in the hiſtory of electricity for no leſs than 1900 years. Indeed, it is ſcarce to be ſuppoſed that during this long interval any perſon applied himſelf to the inveſtigation of the ſubject; as, for the greateſt part of it, ſcience of every kind was almoſt totally extinguiſhed. The electrical properties of jet, however, and, according to Mr Boſe, of the agate, were ſome way or other diſcovered during the abovementioned period. But it was not till the beginning of the 17th century, that the ſubject of electricity became properly a diſtinct ſcience, and the foundation was laid of thoſe diſcoveries which have ſince taken place.

2
Diſcoveries of Dr Gilbert.

The firſt who can properly be called an *electrician*, was Dr William Gilbert, who, in the year 1600, wrote a book *de Magnete*, which contains a variety of electrical experiments. All theſe, however, conſidered only the attractive property of certain ſubſtances, which, from their agreement in this reſpect with amber (in Latin *electrum*), were called *electric*. Dr Gilbert's merit conſiſts in his having been at great pains to find out a number of ſuch ſubſtances, and thus conſiderably enlarging the number of electrics.

Till the year 1670, it doth not appear that any farther diſcoveries were made; except ſome trifling additions to the catalogue of electrics. About this time, Mr Boyle applied himſelf to the ſtudy of electricity. He enlarged the catalogue of electrics; and found that their electric properties were increaſed by wiping and warming them before they were rubbed. He obſerved alſo, that all kinds of bodies were attracted promiſcuouſly; and imagined that they were attracted *in vacuo* as well as in air. This laſt poſition, however, is denied by Mr Beccaria; and we ſhall afterwards ſhow that Mr Boyle muſt neceſſarily have been miſtaken. He alſo obſerved the electric light, though only in the inſtance of ſome diamonds.

3
Diſcoveries of Otto Guericke and Sir Iſaac Newton.

Otto Guericke, however, who was cotemporary with Mr Boyle, improved the ſcience much farther. He made uſe of a ſulphur globe, whirled on an axis much in the ſame way with our preſent glaſs globes. Thus he could excite a vaſtly greater power of electricity than any of his predeceſſors, and try all their experiments to much more advantage. He diſcovered electric repulſion; and not only ſaw the electric light more clearly than Mr Boyle, but heard the hiſſing ſound with which it is emitted. He alſo made another remarkable diſcovery, but which has ſince been very generally overlooked; namely, that a feather, when repelled by an excited electric, always keeps the ſame face towards the body which repels it, as the moon does to the earth.

The next diſcovery of any moment was made by Sir Iſaac Newton; who obſerved, that the electric attraction and repulſion penetrated through glaſs; and it is much to be regretted that this accurate philoſopher did not apply himſelf to the ſtudy of electricity with greater aſſiduity.

4
Remarkable diſcovery by Mr Haukſbee.

In 1709, a treatiſe was written on electricity by Mr Haukſbee; who not only far excelled all his predeceſſors and cotemporaries, but alſo made ſome diſcoveries which well deſerve the attention of the moſt expert electricians at this day. Beſides a variety of new experiments made upon electric attraction and repulſion, as well as the light emitted by electric bodies; he found a method of rendering opaque bodies tranſparent by means of electricity. He lined more than half the inſide of a glaſs globe with ſealing-wax; and having exhauſted the globe, he put it in motion; when applying his hand to excite it, he ſaw the ſhape and figure of all the parts of his hand diſtinctly and perfectly, on the concave ſuperficies of the wax within, juſt as if only pure glaſs without any wax at all had been interpoſed between his eye and his hand. The lining of wax, where it was ſpread the thinneſt, would but juſt allow the ſight of a candle through it in the dark; but in ſome places the wax was at leaſt an eighth part of an inch thick. Yet, even in theſe places, the light and figure of his hand were as diſtinguiſhable through it as any where elſe. The ſealing-wax did not adhere to the glaſs in all places; but this made no difference with regard to the tranſparency. Pitch anſwered the purpoſe equally well with ſealing-wax.

M. Haukſbee alſo made a farther improvement, by uſing a glaſs globe, which acts much more powerfully than a ſulphur one. After his death, however, not only the uſe of glaſs globes, but even the ſtudy of electricity itſelf, ſeems to have been pretty generally laid aſide for ſome time. The reaſon of this was, that the recent diſcoveries of Sir Iſaac Newton engroſſed the attention of philoſophers to ſuch a degree, that they had no leiſure for any thing elſe. After the death of that great man, however, the ſcience of electricity began to revive; and, in 1729, a capital diſcovery was made by Mr Stephen Grey. This was the diſtinction between conductors and non-conductors of electricity. As the diſcovery was entirely accidental, and attended with ſeveral curious circumſtances, we ſhall here give ſome account of it. In the month of February 1729, Mr Grey, after ſome fruitleſs attempts to excite an electric power in metals, recollected a ſuſpicion he had for ſome time entertained, that as a glaſs tube, when excited in the dark, communicated its light to various bodies, it might at the ſame time poſſibly communicate to them an electricity; that is, a power of attracting light bodies; which, as yet, was all that was underſtood by the word *electricity*. For this purpoſe he provided himſelf with a glaſs tube, three feet five inches long, and near one inch and two-tenths in diameter. To each end was fitted a cork; to keep the duſt out when the tube was not in uſe. His firſt experiments were made with a view to determine whether the tube would attract equally well with the ends ſhut as with them open. In this reſpect there was no difference; but he found that the corks attracted and repelled light ſubſtances as well, and rather better, than the tube itſelf. He then fixed an ivory ball upon a ſtalk of fir about four inches long, and thruſting the end of the ſtalk into one of the corks, he found the ball endowed with a ſtrong attractive and repulſive virtue. This experiment he repeated in many different ways; fixing the ball upon long ſticks, and upon pieces of braſs and iron wire, always with the ſame ſucceſs; but he conſtantly obſerved, that the ball at the end attracted more vigorouſly than that part of the wire neareſt the tube.

5
Difference
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The inconvenience of uſing long wires in this manner, put Mr Grey upon trying whether the ball might be ſuſpended by a pack-thread with a loop on the tube, with equal ſucceſs; and the event fully anſwered his expectation. Having thus ſuſpended bodies of the greateſt length he conveniently could, to his tube, he aſcended a balcony 26 feet high, and faſtening a ſtring to his tube, found that the ball would attract light bodies on the ground below. This experiment ſucceeded in the greateſt heights to which he could aſcend; after which, he attempted to carry the electricity horizontally. His firſt attempt miſcarried, becauſe he ſuſpended his line, which was intended to carry the electricity horizontally, by a pack-thread; and thus the fluid got off from it: but though Mr Grey knew this was the caſe, he could not at any time think of any method to prevent it.

On the 30th of June 1729, Mr Grey paid a viſit to Mr Wheeler, in order to give him a ſpecimen of his experiments; but told him of the unſucceſsful attempt he had made to carry the electric fluid horizontally. Mr Wheeler propoſed to ſuſpend the conducting line by *ſilk* inſtead of *pack-thread*. For this advice he could give no reaſon, but that the ſilk thread was *ſmaller* than the other: however, with it they ſucceeded perfectly well. Their firſt experiment was in a matted gallery at Mr Wheeler's houſe, on the 2d of July 1729. About four feet from the end of the gallery they faſtened a line acroſs the place. The middle of this line was ſilk, the reſt pack-thread. Over the ſilken part they laid one end of the conducting line, to which was faſtened the ivory ball, and which hung down about nine feet below the line ſtretched acroſs the gallery. The conducting line was 80½ feet in length, and the other end of it was faſtened by a loop to the electric tube. Upon rubbing the tube, the ivory ball attracted and repelled light ſubſtances as the tube itſelf would have done. They next contrived to return the line, ſo that the whole length of it amounted to 147 feet; which alſo anſwered pretty well. But, ſuſpecting that the attraction would be ſtronger without doubling or returning the line, they made uſe of one carried ſtraight forward for 124 feet; and, as they expected, found the attraction in this manner ſtronger than when the line had been doubled. Thus they proceeded with their experiments; ſtill adding more conducting line, till at laſt their ſilk-ſtring broke with the weight. This they endeavoured to ſupply, firſt with a ſmall iron-wire, and then with a braſs one. The reſult of theſe experiments, however, ſoon convinced them that the ſilk refuſed to conduct the electric fluid, not on account of its *ſmallneſs*, as they had ſuppoſed, but on account of ſome difference in the matter. The wires were ſmaller than the ſilk-thread, yet the electricity was effectually carried off by them. They had recourſe, therefore, to thicker lines of ſilk; and thus conveyed the electric matter to the diſtance of 765 feet; nor did they perceive the virtue to be at all diminiſhed by the diſtance to which it was carried.

This diſcovery of the non-conducting power of ſilk was quickly followed by a diſcovery of the ſame power in many other ſubſtances: and thus, in fact, the foundation of almoſt all the ſubſequent improvements in electricity was laid; though in the ſciences, as well as in moſt others, few diſcoveries have been made by reaſoning, but many by accident. Mr Grey continued to ſtudy electricity as long as he lived; and has given a ſet of experiments, of which Dr Prieſtley ſays, "It is not eaſy to know what to make of them." He imagined that he had diſcovered in all electric ſubſtances a *perpetual attractive power*, which required no kind of excitation either by heating, rubbing, or any kind of attrition. He took 19 different ſubſtances, which were either roſin, gum-lac, ſhell-lac, bees-wax, ſulphur, pitch, or two or three of theſe differently compounded. Theſe he melted in a ſpherical iron ladle; except the ſulphur, which was beſt done in a glaſs veſſel. When theſe were taken out of the ladle, and their ſpherical ſurface hardened, he ſays they would

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would not attract till the heat was abated, or till they came to a certain degree of warmth; that there was then a ſmall attraction, which increaſed till the ſubſtance was cold, when it was very conſiderable. The manner in which he kept theſe ſubſtances in a ſtate of attraction was, by wrapping them in any thing which would preſerve them from the external air. At firſt, for the ſmaller bodies he uſed white paper, and for the larger ones white flannel; but afterwards, he found that black worſted ſtockings would do as well. When thus wrapped up, they were put into a large firm box, where they remained till he had occaſion to uſe them. Thus prepared, they retained their attractive virtue for four months. Theſe experiments are ſimilar to ſome others lately made and publiſhed as new diſcoveries.

7
igines can imi- the netary tions.

Some other experiments were made by Mr Grey, with regard to the attraction of electric bodies *in vacuo;* and in this he determined with Mr Boyle againſt the opinion of Mr Beccaria above mentioned. But the moſt remarkable experiments mentioned by Mr Grey, are his imitations of the planetary motions. "I have lately made (ſays he) ſeveral new experiments upon the projectile and pendulous motions of ſmall bodies by electricity; by which ſmall bodies may be made to move about large ones, either in circles or ellipſes; and thoſe either concentric or eccentric to the centre of the large body about which they move, ſo as to make many revolutions about them. And this motion will conſtantly be the ſame way that the planets move about the ſun, viz. from the right hand to the left, or from weſt to eaſt. But theſe little planets, if I may ſo call them, move much faſter in their apogeon than in the perigeon parts of their orbits; which is directly contrary to the motion of the planets about the ſun." The manner in which theſe experiments were made, as delivered by him on his death-bed to Dr Mortimer, was as follows: "Place a ſmall iron globe (ſaid he), of an inch or an inch and an half in diameter, on the middle of a circular cake of roſin, ſeven or eight inches in diameter, gently excited; and then a light body ſuſpended by a very fine thread, five or ſix inches long, held in the hand over the centre of the cake, will, of itſelf, begin to move in a circle round the iron globe, and conſtantly from weſt to eaſt. If the globe is placed at any diſtance from the centre of the circular cake, it will deſcribe an ellipſe, which will have the ſame eccentricity as the diſtance of the globe from the centre of the cake. If the cake of roſin be of an elliptical form, and the iron globe be placed in the centre of it, the light body will deſcribe an elliptical orbit of the ſame eccentricity with the form of the cake. If the globe be placed in or near one of the foci of the elliptical cake, the light body will move much ſwifter in the apogee than in the perigee of its orbit. If the iron globe is fixed on a pedeſtal an inch from the table, and a glaſs hoop, or a portion of a hollow glaſs cylinder excited, be placed round it, the light body will move as in the circumſtances mentioned above, and with the ſame varieties." He ſaid, moreover, that the light body would make the ſame revolutions, only ſmaller, round the iron globe placed on the bare table, without any electrical body to ſupport it: but he acknowledged that he had not found the experiment ſucceed if the thread was ſupported by any thing but a human hand, though he imagined any other animal ſubſtance would have anſwered the purpoſe.

Theſe experiments occaſioned a great deal of ſpeculation. Dr Mortimer was the only perſon who was able to repeat them with ſucceſs, and he only when nobody but himſelf was preſent. It was therefore generally ſuppoſed that both he and Mr Grey had been deceived: but from ſome experiments to be related hereafter, it ſeems probable that the ſucceſs of Mr Grey and Dr Mortimer was owing to their having performed their experiments with candle-light; and the failure of the others, to their having attempted them by day-light. Notwithſtanding which, it is more than probable that Mr Grey has been deceived in a number of particulars; for no motion can be performed by an artificial excitation of the electric fluid, but what is attended with much irregularity.

8
Vitreous and reſinous electricity diſcovered by Mr Du Fay.

Soon after Mr Grey's diſcovery of the difference between conductors and non-conductors of electricity, Mr Du Fay diſcovered the difference between poſitive and negative, or, as they were for ſome time called, the *vitreous* and *reſinous* electricities. This diſcovery was quite accidental. It was made in conſequence of his caſually obſerving, that a piece of leaf-gold, repelled by an excited glaſs tube, and which he meant to chaſe about the room with a piece of excited gum copal, inſtead of being repelled by it as it was by the glaſs tube, it was eagerly attracted. The ſame was the caſe with ſealing-wax, ſulphur, roſin, and a number of other ſubſtances. He diſcovered alſo, that it was impoſſible to excite a tube in which the air was condenſed.

In the year 1742, the uſe of glaſs globes was again introduced by Mr Boſe, profeſſor of philoſophy at Wittemburgh; though ſome attribute this to Chriſtian Auguſtus Hanſen, profeſſor of mathematics at Leipſic. He added alſo a prime conductor, which conſiſted of a tube of iron or tin. It was at firſt ſupported by a man ſtanding upon cakes of roſin; but afterwards ſuſpended by ſilk lines horizontally before the globe. A bundle of thread was put into the end next to the globe, which not only prevented any injury to the glaſs, put rendered the electricity ſtronger.

9
Electrical ſhock diſcovered.

The moſt remarkable diſcovery that hath yet been made in the ſcience of electricity, was in the end of the year 1745, and beginning of 1746. This was the method of giving the electric ſhock, or the accumulation of the power of electricity in a vial. This had its name of the *Leyden vial*, from Mr Cunæus, a native of Lyden, who exhibited it as he was repeating ſome experiments made by Meſſrs Muſchenbroek and Allamand, profeſſors in the univerſity of that city. He was not, however, the inventor. The merit of this diſcovery (if any merit can ariſe from a diſcovery made by accident) belongs to Mr Van Kleiſt, dean of the cathedral at Camin. On the 4th of November 1745, he ſent the following account of it to Dr Leiberkuhn at Berlin: "When a nail, or a piece of thick braſs wire, &c. is put into a ſmall apothecary's vial, and electrified, remarkable effects follow: but the vial muſt be very dry, or warm. I commonly rub it over before-hand with a finger, on which I put ſome pounded chalk. If a little mercury or a few drops of ſpirit of wine are put into it, the experiment ſucceeds the better. As ſoon as this phial and nail are removed from the electrifying glaſs, or the prime conductor to which it hath been expoſed is taken away, it throws out a pencil of flame ſo long, that with this burning machine in my hand, I have taken above 60 ſteps in walking about my room. When it is electrified ſtrongly, I can take it into another room, and there fire ſpirits of wine with it. If while it is electrifying, I put my finger, or a piece of gold which I hold in my hand, to the nail, I receive a ſhock which ſtuns my arms and ſhoulders.

"A tin tube, or a man placed upon electrics, is electrified much ſtronger by this means than in the common way. When I preſent this vial and nail to a tin tube, which I have 15 feet long, nothing but experience can make a perſon believe how ſtrongly it is electrified. Two thin glaſſes have been broken by the ſhock of it."

Soon after this, a method of giving the ſhock was diſcovered in Holland by Mr Cunæus, in the following manner: M. Muſchenbroek and his friends, obſerving that electrified bodies expoſed to the common atmoſphere, which is always replete with conducting particles of various kinds, ſoon loſt their electricity, and were capable of retaining but a ſmall quantity of it; imagined, that, were the electrified bodies terminated on all ſides by original electrics, they might be capable of receiving a ſtronger power and retaining it for a longer time. Glaſs being the moſt convenient electric for this purpoſe, and water the moſt convenient non-electric, they firſt made theſe experiments with water in glaſs bottles: but no conſiderable diſcovery was made, till Mr Cunæus, happening to hold his glaſs veſſel in one hand, and endeavouring to diſengage it from the conductor with the other (when he imagined the water had received as much electricity as the machine could give it), was ſurpriſed with a ſudden ſhock in his arms and breaſt, which he had not in the leaſt expected.

10
Behaviour of different philoſophers on this occaſion.

The diſcovery of ſuch a terrible effect of the electric power immediately raiſed the attention of all the philoſophers in Europe. Many of them greatly exaggerated their accounts; either from a natural timidity, or their love of the marvellous. Mr Muſchenbrock, who tried the experiment with a very thin glaſs bowl, told Mr Reaumur in a letter wrote ſoon after the experiment, That he felt himſelf ſtruck in his arms, ſhoulder, and breaſt, ſo that he loſt his breath; and was two days before he recovered from the effects of the blow and the terror. He added, that he would not take a ſecond ſhock for the whole kingdom of France. Mr Allamand, who made the experiment, with a common beer-glaſs, ſaid, that he loſt his breath for ſome moments; and then felt ſuch an intenſe pain all along his right arm, that he was apprehenſive of bad conſequences, but it ſoon after went off without any inconvenience, &c. Other philoſophers, on the contrary, ſhowed their heroiſm and magnanimity, by receiving a number of electric ſhocks as ſtrong as they could poſſibly make them. Mr Boſe above mentioned, wiſhed that he might die by the electric ſhock, in order to furniſh, by his death, an article for the memoirs of the academy of ſciences at Paris. "But (adds Dr Prieſtley, from whom this account is taken), *it is not given* to every electrician to die in ſo glorious a manner as the juſtly envied Richman."

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Incredibl powers at-
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From the time of this diſcovery, electricity became the general ſubject of converſation. A great number of people all over Europe got their livelihood by going about and ſhowing the phenomena of it; and, at the ſame time, the paſſion for the marvellous ſtrongly diſcovered itſelf in ſome effects of electricity, pretended to be found out in Italy and Germany. It was aſſerted by Signior Pivati at Venice, and after him by Verati at Bologna, Mr Bianchi at Turin, and Mr Winckler at Leipſic, that if odoriferous ſubſtances were confined in glaſs veſſels, and the veſſels excited, the odours and other medicinal virtues would tranſpire through the glaſs, infect the atmoſphere of the conductor, and communicate the virtue to all perſons in contact with it; alſo, that thoſe ſubſtances, held in the hands of perſons electrified, would communicate their virtues to them; ſo that the medicines might be made to operate without being taken into the ſtomach. They even pretended to have wrought many cures by the help of electricity applied in this way. To ſee the wonderful effects of theſe *medicated tubes*, as they were called, Mr Nollet travelled into Italy, where he viſited all the gentlemen who had publiſhed any account of theſe experiments. But tho' he engaged them to repeat their experiments in his preſence, and upon himſelf; and though he made it his buſineſs to get all the information he could concerning them; he returned fully convinced, that in no inſtance had odours been found to tranſpire through the pores of excited glaſs, and that no drugs had ever communicated their virtues to people who had only held them in their hands while they were electrified. He was convinced, however, that by continued electrification without drugs, ſeveral perſons had found conſiderable relief in various diſorders; particularly, that a paralytic perſon had been cured at Geneva, and that one who was deaf of an ear, another who had a violent pain in his head, and a woman with a diſorder in her eyes, had been cured at Bologna; ſo that from this time we may date the introduction of electricity into the medicinal art. See MEDICINE-*Index*.

Another wonderful experiment was the *beatification* of Mr Boze; which other electricians, for a long time, endeavoured to repeat after him, but to no purpoſe. His deſcription of this remarkable experiment was, that if, in electrifying, large globes were employed, and the electrified perſon ſtood upon large cakes of pitch, a lambent flame would by degrees ariſe from the pitch, and ſpread itſelf around his feet; that from thence it would be propagated to his knees and body, till at laſt it aſcended to his head; that then, by continuing the electrification, the perſon's head would be ſurrounded by a glory ſuch as is in ſome meaſure repreſented by painters in their ornamenting the heads of ſaints. Dr Watſon took the utmoſt pains to repeat this experiment. He underwent the operation ſeveral times, and was ſupported during the time of it by ſolid electrics three feet high. Being electrified very ſtrongly, he felt a kind of tingling on the ſkin of his head and in many other parts of his body. The ſenſation reſembled what would ariſe from a vaſt number of inſects crawling over him at the ſame time. He conſtantly obſerved the ſenſation to be the greateſt in thoſe parts of his body which were neareſt to any non-electric; but no light appeared upon his head, though the experiment was ſeveral times made in the dark, and with ſome continuance. At laſt the Doc-

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tor wrote to Mr Boze himſelf, and his anſwer ſhowed that the whole had been a trick. Mr Boze acknowledged that he had made uſe of a ſuit of armour, which was decked with many bullions of ſteel, ſome pointed like nails, others like wedges, and ſome pyramidal; and that when the electriſation was very vigorous, the edges of the helmet would dart forth rays ſomething like thoſe which are painted on the heads of ſaints.

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The identity of the electrical matter with lightning is a diſcovery that hath been of more practical uſe to mankind than any other. From almoſt the firſt diſcovery of the electric light, and the crackling with which it is emitted, a ſimilarity between it and the phenomena of thunder and lightning had been obſerved. This is taken notice of by Dr Wall, one of the firſt who viewed the electric light in any perfect manner. The Abbé Nollet, Mr Winckler, and others, alſo enumerated many reſemblances between the phenomena of electricity and thoſe of thunder; but they did not think of any method by which their ſuſpicions could be brought to the teſt of experience. This was firſt propoſed by Dr Franklin in 1750. He had before diſcovered the effects of pointed bodies in drawing off the electric matter more powerfully than others. This was ſuggeſted to him by one Mr Thomas Hopkinſon, who electrified an iron ball of three or four inches diameter with a needle faſtened to it, expecting to draw a ſtronger ſpark from the point of it; but was ſurpriſed to find little or none. Dr Franklin, improving on this hint, ſuppoſed that pointed rods of iron, fixed in the air when the atmoſphere was loaded with lightning, might draw from it the matter of the thunder-bolt, without noiſe or danger, into the body of the earth. His account of this ſuppoſition is given by himſelf in the following words. "The electric fluid is attracted by points. We do not know whether this property be in lightning; but ſince they agree in all the particulars in which we can already compare them, it is not improbable, that they agree likewiſe in this; let the experiment be made."

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ed.

This ſuſpicion of Dr Franklin's was verified in 1752, and the diſcovery is perhaps the only one in the whole ſcience that hath not been the reſult of accident. The moſt active perſons were two French gentlemen, Meſſrs Dalibard and Delor. The former prepared his apparatus at Marly la Ville, ſituated five or ſix leagues from Paris; the other at his own houſe, on ſome of the higheſt ground in that capital. Mr Dalibard's machine conſiſted of an iron rod 40 feet long, the lower extremity of which was brought into a centry-box, where the rain could not come; while on the outſide it was faſtened to three wooden poſts by long ſilken ſtrings defended from the rain. This machine happened to be the firſt that was favoured with a viſit of the etherial fire. Mr Dalibard himſelf was not at home; but, in his abſence, he had entruſted the care of his apparatus to one Coiffier a joiner, who had ſerved 14 years among the dragoons, and on whoſe courage and underſtanding he could depend. This artiſan had all the neceſſary inſtructions given him; and was deſired to call ſome of his neighbours, particularly the curate of the pariſh, whenever there ſhould be any appearance of a thunder ſtorm. At length the long expected event arrived. On Wedneſday the 10th of May 1752, between two and three in the afternoon, Coiffier heard a pretty loud clap of thunder. Immediately he ran to the machine, taking with him a phial furniſhed with a braſs wire; and preſenting the wire to the end of the rod, a ſmall ſpark iſſued from it with a ſnap like that which attends a ſpark from an electrified conductor. Stronger ſparks were afterwards drawn in the preſence of the curate and a number of other people. The curate's account of them was, that they were of a blue colour, an inch and an half in length, and ſmelled ſtrongly of ſulphur. In making them, he received a ſtroke on his arm a little below the elbow; but he could not tell whether it came from the braſs wire inſerted into the phial, or from the bar. He did not attend to it at the time; but the pain continuing, he uncovered his arm when he went home in the preſence of Coiffier. A mark was perceived round it, ſuch as might have been made by a blow with the wire on his naked ſkin.

About a month after this, Dr Franklin himſelf had an opportunity of verifying his own hypotheſis. He was waiting for the erection of a ſpire in the city of Philadelphia, not imagining that a pointed rod of a moderate height could anſwer the purpoſe. At laſt it occurred to him, that by means of a common kite he could have a readier acceſs to the higher regions of the atmoſphere than any other way whatever. Preparing, therefore, a large ſilk handkerchief and two croſs ſticks of a proper length on which to extend it, he took the opportunity of the firſt approaching thunder-ſtorm to take a walk into a field where there was a ſhed convenient for his purpoſe. But dreading the ridicule which too commonly attends unſucceſsful attempts in ſcience, he communicated his intention to nobody but his ſon, who aſſiſted him in raiſing the kite. A conſiderable time elapſed before there was any appearence of ſucceſs. One very promiſing cloud had paſſed over the kite without any effect; when, juſt as he was beginning to deſpair, he obſerved ſome looſe threads of the hempen ſtring to ſtand erect and avoid one another, juſt as if they had been ſuſpended by the conductor of a common electrical machine. On this he preſented his knuckle to a key which was faſtened to the ſtring, and thus obtained a very evident electric ſpark. Others ſucceeded even before the ſtring was wet; but when the rain had begun to deſcend, he collected electric fire pretty copiouſly. He had afterwards an inſulated iron rod to draw the lightning into his houſe; and performed almoſt every experiment with real lightning that had before been done with the artificial repreſentations of it by electrical machines.

14
Danger of
making experiments
with lightning.

Thus a new field was opened for philoſophers; but it was ſoon found, that experiments of this kind were not always to be made without danger. This very year, 1752, the Abbe Nollet publiſhed ſome cautions to thoſe who tried experiments on lightning. He had been informed by letters from Florence and Bologna, that ſome people there had received violent ſhocks while they drew ſparks from an iron bar electrified by thunder. One of his correſpondents informed him, that once, as he was endeavouring to faſten a ſmall chain with a copper ball at one of its extremities to a great chain which communicated with the bar at the top of the building, there came a flaſh of lightning which he did not ſee, but which affected the chain with a noiſe like that of wild-fire. The obſerver in-

ſtantly

ſtantly received ſuch a ſhock, that the ball fell out of his hands, and he was ſtruck backwards four or five paces.

15 Profeſſor Richman killed by lightning.

The greateſt inſtance of the danger of theſe experiments, however, was the death of Mr Richman profeſſor at Peterſburgh above-mentioned. This happened on the 6th of Auguſt 1753, as he was making experiments on lightning drawn into his own room. He had provided himſelf with an inſtrument for meaſuring the quantity of electricity communicated to his apparatus; and as he ſtood with his head inclined to it, Mr Solokow an engraver, who was near him, obſerved a globe of blue fire, as big as his fiſt, jump from the inſtrument, which was about a foot diſtant, to Mr Richman's head. The profeſſor was inſtantly dead, and Mr Solokow was alſo much hurt. The latter, however, could give no particular account of the way in which he was affected; for, at the time the profeſſor was ſtruck, there aroſe a ſort of ſteam or vapour, which entirely benumbed him, and made him ſink down to the ground, ſo that he could not even remember to have heard the clap of thunder, which was a very loud one. The globe of fire was attended with an exploſion like that of a piſtol; the inſtrument for meaſuring the electricity (called by the profeſſor an *electrical gnomon*), was broken to pieces, and the fragments thrown about the room. Upon examining the effects of the lightning in the profeſſor's chamber, they found the door-caſe half ſplit through, and the door torn off and thrown into the room. They opened a vein in the body twice, but no blood followed; after which, they endeavoured to recover life by violent friction, but in vain: upon turning the corpſe with the face downwards during the rubbing, an inconſiderable quantity of blood ran out of the mouth. There appeared a red ſpot on the forehead, from which ſpirted ſome drops of blood through the pores, without wounding the ſkin. The ſhoe belonging to the left foot was burſt open, and uncovering the foot at that part, they found a blue mark; from whence it was concluded, that the electric matter having entered at the head, made its way out again at that foot. Upon the body, particularly on the left ſide, were ſeveral red and blue ſpots reſembling leather ſhrunk by being burnt. Many more alſo became viſible over the whole body, and particularly over the back. That upon the forehead changed to a browniſh red, but the hair of the head was not ſinged. In the place where the ſhoe was unripped, the ſtocking was entire; as was the coat every where, the waiſtcoat only being ſinged on the foreflap where it joined the hinder: but there appeared on the back of Mr Solokow's coat long narrow ſtreaks, as if red-hot wires had burned off the nap, and which could not well be accounted for.

When the profeſſor's body was opened next day, the cranium was very entire, having neither fiſſure nor contra-fiſſure: the brain was ſound; but the tranſparent pellicles of the wind-pipe were exceſſively tender, and eaſily rent. There was ſome extravaſated blood in it, as alſo in the cavities below the lungs. Thoſe of the breaſt were quite ſound; but thoſe towards the back of a browniſh black colour, and filled with more of the blood above mentioned. The throat, the glands, and the ſmall inteſtines, were all inflamed. The ſinged leather-coloured ſpots penetrated the ſkin only. In 48 hours the body was ſo much corrupted that they could ſcarce get it into a coffin.

16 Conduc uſed for preſervi houſes.

Since the diſcovery of the identity of lightning and the electric matter, long rods of iron or other metal have been made uſe of with a view to protect buildings from the danger of ſtrokes of lightning. A conſiderable diſpute has been carried on whether theſe rods ought to be pointed or not; but a committee of the royal ſociety have very lately determined it in favour of the former.

For ſome time, the ſcience of electricity ſeems to have been at a ſtand. Numberleſs improvements indeed have been made upon what was before diſcovered, but ſcarce any thing new hath been added. The only thing which can properly be reckoned a new diſcovery is that of the *electrophorus* by Signior Volta an Italian; which on many accounts may be reckoned the moſt ſurpriſing machine hitherto invented.

## SECT. III. *Of the Apparatus neceſſary for exciting Electricity, and communicating it to other Bodies*, &c.

THE inſtruments moſt in uſe for this purpoſe are thoſe called *electrical machines*, of which there have been ſo many different forms, that it would be tedious and difficult to give only a very ſhort deſcription of them all. We ſhall therefore firſt lay down the moſt neceſſary rules for conſtructing electrical machines in general; and then give a particular deſcription of thoſe machines which are moſt generally uſeful, and contain all the improvements hitherto made.

### § 1. *Of the Conſtruction of Electrical Machines.*

*Cavallo Electric*

THE principal parts of the machine are the electric, the moving engine, and the prime conductor, *i. e.* an inſulated conductor, which immediately receives the electricity from the excited electric.

17 What ſ ſtances moſt p per.

Formerly, different kinds of electrics were uſed, as glaſs, roſin, ſulphur, ſealing-wax, &c. Their forms were alſo various, as globes, cylinders, ſpheroids, &c. The reaſon of this variety was, in the firſt place, that it was not then aſcertained what ſubſtance acted moſt powerfully; and ſecondly, in order to produce a poſitive or negative electricity at pleaſure. At preſent ſmooth glaſs only is uſed; for when the machine has an inſulated rubber, the operator may produce poſitive or negative electricity at his pleaſure, without changing the electric. In regard to the form of the glaſs, thoſe commonly uſed at preſent are globes and cylinders. The moſt convenient ſize for a globe, is from nine to twelve inches diameter. They are made with one neck, which is cemented to a ſtrong braſs cap in order to adapt them to a proper frame. The beſt cement for electrical purpoſes is made with two parts of roſin, two of bees-wax, and one of the powder of red ochre. Theſe ingredients are melted, and mixed together in any veſſel over the fire; and afterwards kept for uſe. This kind of cement ſticks very faſt; and is much preferable to roſin only, as it is not ſo brittle, and at the ſame time inſulates equally well. The cylinders are made with two necks; they are uſed to the greateſt advantage without any axis; and their common ſize is from four inches diameter and eight inches long, to

twelve

Plate CLXXIII.

*Echeneis.*

*Echinus.*

*Elater.*

# ELECTRICITY.

*Fig. 2.*

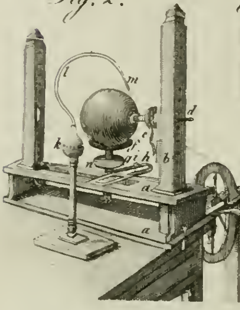

*Fig. 1.*

*Fig. 3.*

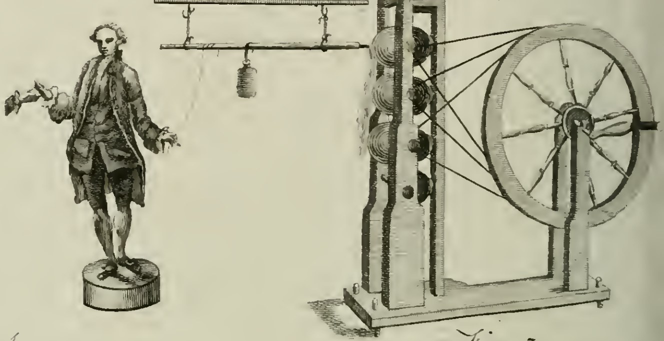

*Fig. 4.*

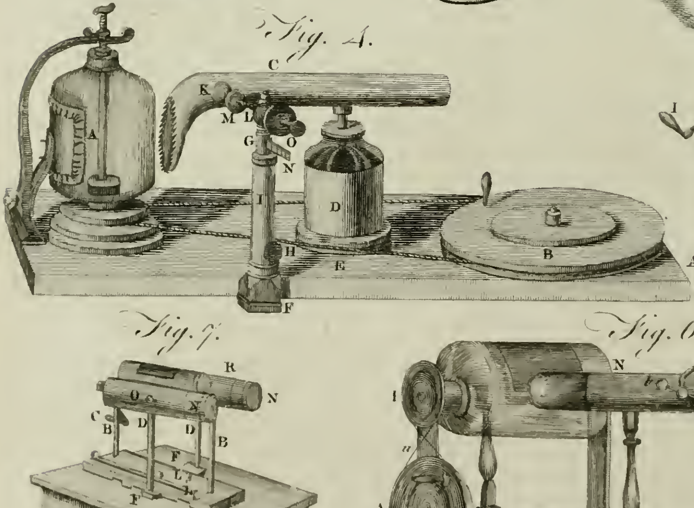

*Fig. 5.*

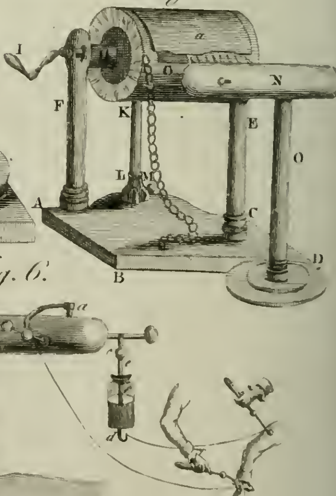

*Fig. 7.*

*Fig. 6.*

*A. Bell Prin. Wal. Sculptor fecit.*

twelve inches diameter and two feet long, which are perhaps as large as the workmen can conveniently make them. The glaſs generally uſed is the beſt flint; though it is not abſolutely determined which kind of metal is the beſt for electrical globes or cylinders. The thickneſs of the glaſs ſeems immaterial, but perhaps the thinneſt is preferable. It has often happened, that glaſs globes and cylinders, in the act of whirling, have burſt in innumerable pieces with great violence, and with ſome danger to the by-ſtanders. Thoſe accidents are ſuppoſed to happen when the globes or cylinders, after being blown, are ſuddenly cooled. It will therefore be neceſſary to enjoin the workmen to let them paſs gradually from the heat of the glaſs-houſe to the atmoſpherical temperature.

It has been long queſtioned, whether a coating of ſome electric ſubſtance, as roſin, turpentine, &c. on the inſide ſurface of the glaſs, has any effect to increaſe its electrical power; but now it ſeems pretty well determined, that if it does not increaſe the power of a good glaſs globe or cylinder, at leaſt it does conſiderably improve a bad one.

18
Compoſition for coating globes.

The moſt approved compoſition for lining glaſs globes or cylinders, is made with four parts of Venice turpentine, one part of roſin, and one part of bees-wax. This compoſition muſt be boiled for about two hours over a gentle fire, and ſtirred very often: afterwards it is left to cool, and reſerved for uſe. When a globe or cylinder is to be lined with this mixture, a ſufficient quantity of it is to be broken into ſmall pieces, and introduced into the glaſs; then, by holding the glaſs near the fire, the mixture is melted, and equally ſpread over all its internal ſurface to about the thickneſs of a ſixpence. In this operation, care muſt be taken that the glaſs be made hot gradually, and be continually turned, ſo that it may be heated equally in all parts, otherwiſe it is apt to break in the operation.

19
How the machine is to be ſet in motion.

In reſpect to the engine which is to give motion to the electric, multiplying wheels have been generally uſed, which, properly adapted, might give the electric a quick motion, while they are conveniently turned by a winch. The uſual method is, to fix a wheel on one ſide of the frame of the machine, which is turned by a winch, and has a groove round its circumference. Upon the braſs cap of the neck of the glaſs globe, or one of the necks of the cylinder, a pulley is fixed, whoſe diameter is about the third or fourth part of the diameter of the wheel: then a ſtring or ſtrap is put over the wheel and the pulley; and, by theſe means, when the winch is turned, the globe or cylinder makes three or four revolutions for one revolution of the wheel. There is an inconvenience generally attending this conſtruction, which is, that the ſtring is ſometimes ſo very ſlack, that the machine cannot work. To remedy this inconvenience, the wheel ſhould be made moveable with reſpect to the electric, ſo that by means of a ſcrew it might be fixed at the proper diſtance; or elſe the pulley ſhould have ſeveral grooves of different radiuſes on its circumference.

It has been cuſtomary with ſome, to turn the cylinder ſimply with a winch, without any accelerated motion; but that ſeems not ſufficient to produce the greateſt electric power the glaſs is capable of giving; for the globe or cylinder ſhould properly make about ſix revolutions in a ſecond, which is more than can be conveniently done with the winch only. This method, however, on account of its ſimplicity and eaſy conſtruction, ſhould not be diſregarded, and it may be conveniently uſed when no very great power is required.

Inſtead of the pulley and the ſtring as above deſcribed, a wheel and pinion, or a wheel and an endleſs ſcrew, has been alſo uſed. This conſtruction may anſwer tolerably well for ſmall table machines; but it muſt be conſtructed with great nicety; otherwiſe it is apt to make a diſagreeable rattling, and, without frequent oiling, ſoon wears away by the great friction of its parts.

20
Conſtruction of the rubber.

The next thing belonging to the electrical machine neceſſary to be deſcribed, is the rubber which is to excite the electric. The rubber, as it is now made, conſiſts of a cuſhion of red Baſil ſkin ſtuffed with hair or flannel, and faſtened to a piece of wood well rounded at the edges. To this is glued a flap of Perſian black ſilk, which nearly goes over one half of the cylinder. The method of uſing the amalgam is by ſpreading it on a ſeparate piece of leather, and applying it occaſionally to the under part of the cylinder while turning. Thus only a very ſmall part of the amalgam is conſumed, at the ſame time that the glaſs is very ſtrongly excited. The moſt powerful compoſition for exciting an electrical cylinder is found to be an amalgam of mercury and zinc, in the proportion of one part of the former to five of the latter. The mercury ought to be previouſly triturated with ſome melted greaſe or bees-wax, by which means the amalgam will be the finer. The compoſition called *Aurum Moſaicum*, *Aurum muſivum*, or *Moſaic gold* *, will anſwer very near as well, though ſomewhat leſs cleanly and agreeable. The rubber itſelf ſhould be ſupported by a ſpring; by which means it will eaſily ſuit any inequalities that may be on the ſurface of the glaſs; and by a ſcrew, it may be made to preſs more or leſs as occaſion requires. It ſhould likewiſe be inſulated in the moſt perfect manner; as, when inſulation is not required, it may be eaſily taken off by a chain or wire hung upon it, and thus communicate with the earth or with any unelectrified body; but where there is no contrivance for inſulating the rubber, it is impoſſible to perform many of the moſt curious electric experiments. In ſhort, to conſtruct the rubber properly, it muſt be made in ſuch a manner, that the ſide it touches in whirling may be as perfect a conductor as it can be made, in order to ſupply electricity as quick as poſſible; and the oppoſite part ſhould be as perfect a non-conductor as poſſible, in order that none of the fluid accumulated upon the glaſs may return back to the rubber; which has been found to be the caſe when the rubber was not made in a proper manner.

21
Beſt kind of amalgam.

22
How to ſupport and inſulate the rubber.

23
Mr Jones's improvement on the ſpring of the rubber.

Mr William Jones of Holborn, London, inſtrument-maker, has made a conſiderable improvement on this part of electrical machines by a very ſimple contrivance. It conſiſts in a ſpring placed within the rubber itſelf; the action of which is found to be better ſuited for adapting the rubber to the inequalities of the glaſs, than that placed entirely without the rubber. It conſiſts of a piece of flexible iron or braſs, repreſented edgeways by *A* fig. 1.; and it is evident that it acts in a much more parallel and uniform manner than the former,

Plate CLXXIII.

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* See *Chemiſtry*, nº 1224.

Apparatus

former, which is conſtantly changing the preſſure of the line of contact betwixt the rubber and cylinder while it paſſes from the under to the upper ſide, and thus rendering the effect inconſtant and uncertain.

24
Prime conductor, &c

We come now to conſider the prime conductor, or firſt conductor; which is nothing more than an inſulated conducting ſubſtance, furniſhed with one or more points at one end, in order to collect the electricity immediately from the electric. When the conductor is of a moderate ſize, it is uſual to make it of hollow braſs; but when it is very large, then, on account of the price of the materials, it is made of paſteboard covered with tin-foil or gilt paper. The conductor is generally made cylindrical; but let the form be what it will, it ſhould always be made perfectly free from points or ſharp edges: and if holes are to be made in it, which on many accounts are very convenient, they ſhould be well rounded, and made perfectly ſmooth. Further, that end of the prime conductor which is at the greateſt diſtance from the electric ought to be made larger than the reſt, as the ſtrongeſt exertion of the electric fluid in eſcaping from the conductor is always at that end.

It has been conſtantly obſerved, that the larger the prime conductor is, the longer and denſer ſpark can be drawn from it; and the reaſon of this is, that the quantity of electricity diſcharged in a ſpark, is nearly proportional to the ſize of the conductor: on this account, the prime conductor is now made much larger than what was formerly uſed. Its ſize, however, may be ſo large, that the diſſipation of the electricity from its ſurface, may be greater than what the electric can ſupply; in which caſe, ſo large a conductor would be nothing more than an unwieldy and diſagreeable incumbrance.

Before we quit the electrical machine, it ſhould be obſerved, that, beſides the above-mentioned parts, it is neceſſary to have a ſtrong frame to ſupport the electric, the rubber, and the wheel. The prime conductor ſhould be ſupported by ſtands, with pillars of glaſs or baked wood, and not by ſilk ſtrings, which admit of continual motion. In ſhort, the machine, the prime conductor, and any other apparatus actually uſed, ſhould be made to ſtand as ſteady as poſſible, otherwiſe many inconveniences will ariſe.

Beſides the electrical machine, the electrician ſhould be provided with glaſs tubes of different ſizes, a pretty large ſtick of ſealing-wax, or a glaſs tube covered with ſealing-wax, for the negative electricity. He ſhould, at leaſt, not be without a glaſs tube about three feet long and one inch and a half in diameter. This tube ſhould be cloſed at one end, and at the other end ſhould have fixed a braſs cap with a ſtop-cock; which is uſeful in caſe it ſhould be required to condenſe or rarify the air within the tube.

The beſt rubber for a tube of ſmooth glaſs is the rough ſide of black oiled ſilk, eſpecially when it has ſome amalgam rubbed upon it; but the beſt rubber for a rough glaſs tube, a ſtick of baked wood, ſealing-wax, or ſulphur, is ſoft new flannel.

25
Directions for coating jars, &c.

The inſtruments neceſſary for the accumulation of electricity are coated electrics; among which, glaſs coated with conductors obtains the principal place: on account of its ſtrength, it may be formed into any ſhape, and it will receive a very great charge. The form of the glaſs is immaterial with reſpect to the charge it will contain; its thickneſs only is to be conſidered: for the thinner it is, the more eaſily will it receive the utmoſt charge it can bear; but it is at the ſame time more ſubject to be broken: for this reaſon, therefore, a thin coated jar or plate may be uſed very well by itſelf, and it is very convenient for many experiments; but when large batteries are to be conſtructed, then it is neceſſary to uſe glaſs a little thicker, and care ſhould be taken to have them perfectly well annealed. If a battery is required of no very great power, as containing about eight or nine ſquare feet of coated glaſs, common pint or half-pint phials may be made uſe of. They may be eaſily coated with tin-foil, ſheet-lead, or gilt-paper, on the outſide, and braſs-filings on the inſide: they occupy a ſmall ſpace, and, on account of their thinneſs, hold a very good charge. But when a large battery is required, then theſe phials cannot be uſed, for they break very eaſily; and for that purpoſe, cylindrical glaſs jars of about 15 inches high, and four or five inches in diameter, are the moſt convenient.

Appara

When glaſs plates or jars, having a ſufficiently large opening, are to be coated, the beſt method is to coat them with tin-foil on both ſides, which may be fixed upon the glaſs with varniſh, gum-water, bees-wax, &c. but in caſe the jars have not an aperture large enough to admit the tin-foil, and an inſtrument to adapt it to the ſurface of the glaſs, then braſs-filings, ſuch as are ſold by the pin-makers, may be advantageouſly uſed; and they may be ſtuck on with gum-water, bees-wax, &c. but not with varniſh, for this is apt to be ſet on fire by the diſcharge. Care muſt be taken that the coatings do not come very near the mouth of the jar, for that will cauſe the jar to diſcharge itſelf. If the coating is about two inches below the top, it will in general do very well: but there are ſome kinds of glaſs, eſpecially tinged glaſs, that when coated and charged, have the property of diſcharging themſelves more eaſily than others, even when the coating is five or ſix inches below the edge. There is another ſort of glaſs, like that of which Florence flaſks are made, which, on account of ſome unvitrified particles in its ſubſtance, is not capable of holding the leaſt charge. On theſe accounts, therefore, whenever a great number of jars are to be choſen for a large battery, it is adviſable to try ſome of them firſt, ſo that their quality and power may be aſcertained.

26
Anoth
ſubſtan
capable
anſwer
the pur
of glaſs

Electricians have often endeavoured to find ſome other electric, which might anſwer better than glaſs for this purpoſe, at leaſt be cheaper; but, except Father Beccaria's method, which may be uſed very well, no remarkable diſcovery has been made relating to this point. He took equal quantities of very pure colophonium, and powder of marble ſifted exceedingly fine, and kept them in a hot place a conſiderable time, where they became perfectly free from moiſture: he then mixed them, and melted the compoſition in a proper veſſel over the fire; and, when melted, poured it upon a table, upon which he had previouſly ſtuck a piece of tin-foil, reaching within two or three inches of the edge of the table. This done, he endeavoured with a hot iron to ſpread the mixture all over the table as equally as poſſible, and to the thickneſs of one-tenth of an inch: he afterwards coated it with another piece of tin-foil reaching within about two inches of the edge of the mixture; in ſhort, he coated a plate of this mixture like a plate of glaſs. This coated plate, from what he ſays, ſeems to have had a greater power than a glaſs plate of the ſame dimenſions, even when the weather was not very dry: and if it is not ſubject to break very eaſily by a ſpontaneous diſcharge, it may be very conveniently uſed; for it doth not very readily attract moiſture, and conſequently may hold a charge of electricity better, and longer, than glaſs: beſides, if broken, it may be repaired by a hot iron; but glaſs, when broken, cannot ſo eaſily be repaired.

27
iſchar-ing rod lect- me-rs, &c.

When a jar, a battery, or in general a coated electric, is to be diſcharged, the operator ſhould be provided with an inſtrument called the *diſcharging rod*, which conſiſts of a metal rod ſometimes ſtraight, but more commonly bended in the form of a C: they are made alſo of two joints, ſo as to open like a kind of compaſſes. This rod is furniſhed with metal knobs at its extremities, and has a non-conducting handle, generally of glaſs or baked wood, faſtened to its middle. When the operator is to uſe this inſtrument, he holds it by the handle; and touching one of the coated ſides of the charged electric with one knob, and approaching the other knob to the other coated ſide, or ſome conducting ſubſtance communicating with it, he completes the communication between the two ſides, and diſcharges the electric.

The inſtruments to meaſure the quantity, and aſcertain the quality, of electricity, are commonly called *electrometers*, and they are of four ſorts: 1. The ſingle thread; 2. the cork or pith balls; 3. the quadrant; and, 4. the diſcharging electrometer. The ſecond ſort of electrometer, *i. e.* the cork-ball electrometer, was invented by Mr Canton; the diſcharging electrometer was invented by Mr Lane, and hath been improved by Mr Henley; another on a different principle by Mr Kinnerſley; and the quadrant electrometer, which is of lateſt invention, is a contrivance of Mr Henley.

Beſides the apparatus above deſcribed, there are ſeveral other inſtruments uſeful for various experiments; but theſe will be deſcribed occaſionally. The electrician, however, ought to have by him, not only a ſingle coated jar, a ſingle diſcharging rod, or, in ſhort, only what is neceſſary to perform the common experiments; but he ſhould provide himſelf with ſeveral plates of glaſs, with jars of different ſizes, with a variety of different inſtruments of every kind, and even tools for conſtructing them; in order that he may readily make ſuch new experiments as his curioſity may induce him to try, or that may be publiſhed by other ingenious perſons who are purſuing their reſearches in this branch of philoſophy.

### § 2. *Deſcription of the moſt uſeful Electrical Machines.*

28
ſcription Doctor eſtley's chine.

2.

The firſt which may be mentioned is that deſcribed by Dr Prieſtley in his hiſtory of electricity; which, on account of its extenſive uſe, may be deſervedly called a *univerſal electrical machine*.—The baſis conſiſts of two oblong boards *a a*, which are placed in a ſituation parallel to one another, about four inches aſunder, and kept in that poſition by two pieces of wood adapted for the purpoſe. Theſe boards, when ſet horizontally on a table, and the lowermoſt of them fixed with iron cramps, form the ſupport of two perpendicular pillars of baked wood, and of the rubber of the machine. One of the pillars, together with the ſpring ſupporting the rubber, ſlides in a groove *a*, which reaches almoſt the whole length of the upper board; and, by means of a ſcrew, may be placed at any required diſtance from the pillar *b*, which is fixed, being put through a mortice in the upper board, and faſtened to the lower. In theſe two pillars are ſeveral holes for the admittance of the ſpindles of different globes; and as they may be ſituated at any diſtance from one another, they may be adapted to receive not only globes, but cylinders and ſpheroids of different ſizes. "In this machine (ſays Dr Prieſtley), more than one globe or cylinder may be uſed at once, by fixing one above the other in the different holes of the pillars; and by adapting to each a proper pulley, they may be whirled all at once, to increaſe the electricity." But this conſtruction has one capital defect, that rubbers cannot be conveniently applied; ſo that the power of ſeveral globes put together in this manner, though greater than one, is by no means equal to what it would be if the power of them all taken ſingly were united. Fig. 3. ſhows a machine of this kind contrived by Dr Watſon.

29
Several globes may be made to unite their power in this machine.

The rubber ought to be made as above directed. It is ſupported by a ſocket which receives the cylindrical axis of a round and flat piece of glaſs or baked wood *g*, the oppoſite part of which is inſerted into the ſocket of a bent ſteel ſpring *h*. Theſe parts are eaſily ſeparated, ſo that the rubber, or the piece of wood that ſerves to inſulate it, may be changed at pleaſure. The ſpring admits of a twofold alteration of poſition; being capable of either ſlipping along the groove, or moving in the contrary direction, the groove being wider than the ſcrew that faſtens the ſpring, ſo as to give it every deſirable poſition with regard to the globe or cylinder; and it is beſides furniſhed with a ſcrew which makes it preſs harder or lighter as the operator chooſes. The wheel of this machine is fixed to the table at *e*, and has ſeveral grooves for admitting more ſtrings than one, in caſe that two or three globes or cylinders are uſed at a time; and as it is diſengaged from the frame of the machine, the latter may be ſcrewed at different diſtances from the former, and ſo would be ſuited to the variable length of the ſtring. The chain connected with the rubber at *n* is for making a communication with the table, when inſulation is not wanted. The prime conductor is made of copper, hollow, and in the form of a pear; having its neck placed upwards, and its bottom, or rounded part *k*, placed on a ſtand of glaſs or baked wood. An arched wire *l* proceeds from its neck, having an open ring at its end, in which ſome ſmall pointed wires *m* are hung, that by playing lightly on the globe or cylinder collect the electric fluid from it.

30
Of Dr Ingenhouſz's

Next to Dr Prieſtley's machine is one invented by Dr Ingenhouſz, and which for its ſimplicity and conciſeneſs makes a fine contraſt with the former.—This machine conſiſts of a circular glaſs-plate about one foot diameter, which is turned vertically by a winch fixed to the iron axis that paſſes through its middle; and it is rubbed by four cuſhions, each about two inches long, ſituated at the oppoſite ends of the vertical diameter. The frame conſiſts of a bottom board, about a foot ſquare, or a foot long and ſix inches broad, which, when the machine is to be uſed, may be faſtened by an iron crank to the table. Upon this board two other ſlender and ſmaller ones are raiſed, which lie parallel to one another, and are faſtened together at their top by a ſmall piece of wood. Theſe upright boards ſupport in their middle the axis of the plate, and to them the rubbers are faſtened. The conductor is of hollow braſs; and from its extremities branches are extended, which, coming very near the extremity of the glaſs, collect the electricity from it.

The power of this machine is perhaps more than a perſon would imagine by looking at it. It may be objected, that this conſtruction will not eaſily admit of the rubbers being inſulated, nor conſequently be adapted to a great variety of experiments: but at the ſame time it muſt be allowed, that it is very portable, that it is not very liable to be out of order, and that it has a power ſufficiently ſtrong for phyſical purpoſes; on which account it may be conveniently uſed.

31
Mr Reid's portable machine.

Fig. 4. repreſents a very portable electrical machine invented by Mr Read, and improved by Mr Lane. *A* is the glaſs cylinder, moved vertically by means of the pulley at the lower end of the axis. This pulley is turned by a large wheel *B* which lies parallel to the table. There are three pulleys of different dimenſions marked in the figure; one of which revolves four times for every revolution of the large wheel *B*. The conductor *C* is furniſhed with points to collect the fluid, and is ſcrewed to the wire of a coated jar *D*, which ſtands in a ſocket between the cylinder and the wheel. The figure alſo repreſents the manner of applying Mr Lane's electrometer to this machine; of which an account ſhall be given afterwards.

Electrical machines have of late years undergone ſome very eſſential alterations and improvements; both from the ſuggeſtions of private electricians and the inventions of Meſſrs Adams, Nairne, and Jones, inſtrument makers of London. We ſhall ſubjoin a deſcription of the moſt approved ones.

32
A machine proper for philoſophical purpoſes.

Fig. 5. repreſents a moſt convenient machine for philoſophical purpoſes, and whoſe power is equal to that of much larger ones of the old conſtruction. The frame of this machine conſiſts of the bottom board *A B C D*; which, when the machine is to be uſed, muſt be faſtened to the table by two braſs or iron cramps made for that purpoſe. Upon the bottom board there are two round pillars *E F* perpendicularly raiſed; which will beſt anſwer the purpoſe if made of baked wood. Theſe ſerve to ſupport the cylinder *G* by the axles of the braſs or wood caps *H*. From one of theſe proceeds the long axle *H*, going through an hole in the pillar *F*; having a ſimple winch *I* fixed on its ſquare end; or ſometimes, as in fig. 6. below a pulley *I*. On the circumference of this pulley are ſeveral grooves in order to ſuit the variable length of the ſtring *a*, which goes round one of them, as well as round the large multiplying wheel *A*. The other cap of the cylinder has a ſmall cavity which fits the conical extremity of a ſtrong ſcrew proceeding from the pillar. The wheel *A*, which is moved by the handle, turns round a ſtrong axle proceeding from about the middle of the ſame pillar. In ſmall machines the ſimple winch may be adopted with great advantage, as is repreſented fig. 5. as not being liable to diſorder; but in large ones the multiplying wheel is indiſpenſibly neceſſary.

Fig. 6.

In all theſe machines the rubber is compoſed of a cuſhion ſtuffed with horſe-hair or flannel, faſtened to a board behind. It is covered with red Baſil leather; and from its under edge a piece of black Perſian ſilk is glued, which goes over the cylinder as at *a*, fig. 5. to near the points of the collector fixed in the conductor. Thus a greater power of electricity is excited than what could have been done by the former machines. In them a piece of leather was faſtened to the lower edge of the cuſhion, bearing againſt the cuſhion itſelf. To this piece of leather another of oiled ſilk was ſewed, covering the cylinder as above deſcribed. In this way ſome of the amalgam above deſcribed was to be laid upon the piece of leather, and worked into its ſubſtance as much as poſſible; but in the preſent method nothing more is neceſſary than to hold an amalgamated piece of leather once or twice to the cylinder while turning. The rubber is fixed to a glaſs pillar *K* (fig. 5.) which is faſtened into a wooden baſis *L* at the bottom. This turns on an hinge; and by means of a ſcrew at *M*, going through the baſis to a fixed block on the frame, the preſſure of the cuſhion may be augmented or diminiſhed at pleaſure; at the ſame time that it is rendered much more ſteady and uniform than by a flat ſliding board and tightening ſcrew as formerly uſed.

The glaſs pillar *K*, as well as all other glaſs pillars, the glaſs feet of inſulating ſtools, &c. ſhould be covered with varniſh or rather ſealing-wax; otherwiſe they will inſulate very imperfectly on account of the moiſture they attract from the air in damp weather. It was uſual to ſupport the rubber upon two ſprings ſcrewed to its back, and which proceeded from the wooden cap of the pillar, in order to give way to and ſuit the inequalities of the glaſs; but by this contrivance the line of contact with the cylinder was not always the ſame, nor its preſſure uniform, as already obſerved: but Mr William Jones has removed this difficulty by the bent ſpring repreſented fig. 1. It is fixed by a ſcrew at *B*, and gives way by ſliding notches at *a a*: its length and breadth are equal to that of the cuſhion, and its thickneſs proportional to the diameter and action of the cylinder upon it. In the machine above deſcribed, the rubber is well inſulated, which is a great advantage when it is neceſſary to connect with the cuſhion a conductor, called the *negative conductor*; and when this happens not to be the caſe, which it uſually is in making the common experiments, a chain with a ſmall hook and ring may be hung to one end of the conductor, the other falling upon the table as in fig. 5.

The prime conductor belonging to this machine is repreſented by *N* in the ſame figure. It receives the electric fluid from the cylinder, and is uſually made of braſs or tin japanned. It is inſulated by the glaſs pillar that ſupports it, and which is ſcrewed into a wooden baſis or foot. It is found more convenient to place the conductor parallel to the cylinder than with one of its ends towards it as was formerly done.

The handle of the wheel *A*, fig. 6. or the ſimple winch *I*, fig. 5. ſhould be ſo turned, that the excited part of the cylinder may revolve from the rubber to the collecting points on the conductor; the prime conductor, ſtanding then as in the figures, will be electrified poſitively, or overcharged with the electric fluid: for by the action of rubbing, the cylinder pumps, as it were, the fluid from the rubber, and every other body properly connected with it, and gives it to the

Plate CLXXI

# ELECTRICITY.

Fig. 8.

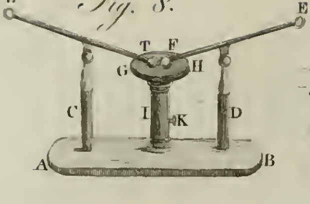

Fig. 10.

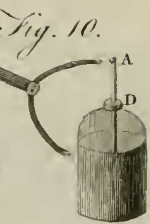

Fig. 9.

Fig. 11.

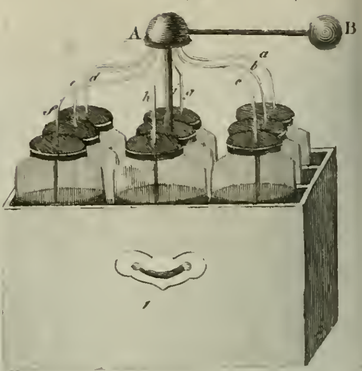

Fig. 12.

Fig. 13.

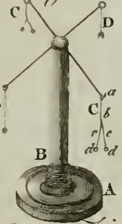

Fig. 14.

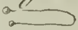

Fig. 15.

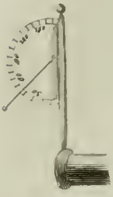

Fig. 18.

Fig. 19.

Fig. 16.

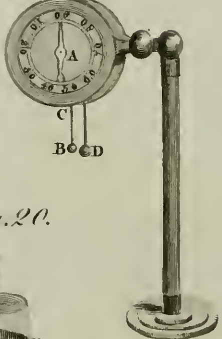

Fig. 17.

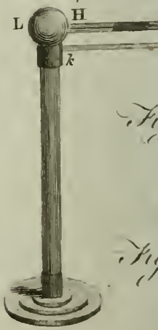

Fig. 22.

Fig. 23.

Fig. 20.

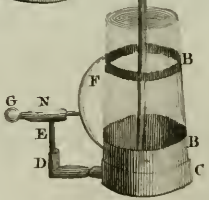

Fig. 24.

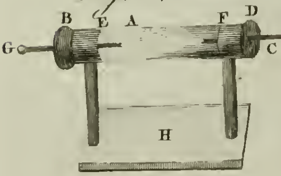

Fig. 21.

Fig. 28. No. 2.

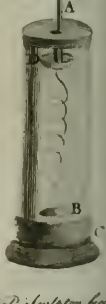

Fig. 25.

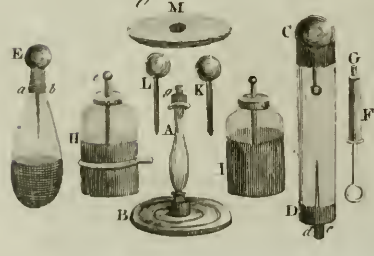

Fig. 26.

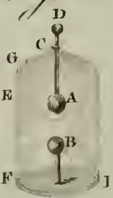

Fig. 28.

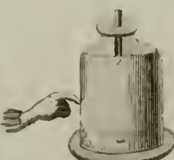

Fig. 27.

A. Bell Prin. Wal. Sculptor fecit.

prime conductor. But if negative electricity be required, the chain muſt be removed from the rubber, and hung to the prime productor: for in this caſe, the electricity of the prime conductor will be communicated to the ground, and the rubber remaining inſulated will appear ſtrongly negative. If another conductor, equal in ſize to *N*, be connected with the rubber, as ſtrong negative electricity may be obtained from the one as poſitive electricity from the other.

33
Medical apparatus.

Fig. 6. repreſents an electrical machine with a conductor in the ſhape of a *T*; and an improved medical apparatus, where it is neceſſary to give the ſhock in the arms, will be more particularly explained afterwards, under the article *Medical Electricity*.

34
Mr Nairne's patent machine.

Fig. 7. ſhows Mr Nairne's patent electrical machine for medical purpoſes. Its principal parts are the glaſs cylinder, generally about 7 inches in diameter and 12 in length, with the two conductors parallel to it. It is furniſhed with wooden caps, and turns in two wooden pieces cemented on the top of two ſtrong glaſs pillars *EB*. Theſe pillars are made faſt into the bottom board of the machine, which is faſtened to the table by means of a crank. There are grooves made in the under part of the bottom of the crank, through which the pieces *FF* ſlide. On theſe pieces the pillars ſtand by which the two conductors are ſupported; and in order to place theſe conductors nearer to the cylinder, or remove them farther from it, the pieces on which they ſtand are moveable outwards or inwards, and may be fixed by the two ſcrew-nuts *LL*. The rubber is faſtened to the conductor *R*; and conſiſts of a cuſhion of leather ſtuffed, having a piece of ſilk glued to its under part. This laſt being turned over the ſurface of the cuſhion, and thus interpoſed between it and the glaſs, goes over the cylinder, and almoſt touches the pointed wires which are fixed on the other conductors for the purpoſe of collecting the electric fluid from the cylinder. The conductors are of tin covered with black lacker, each of them containing a large coated glaſs jar, and likewiſe a ſmaller one, or a coated tube, which are viſible when the caps *NN* are removed. To each conductor is fixed a knob *O*, for the occaſional ſuſpenſion of a chain to produce poſitive or negative electricity. That part of the winch *C* which acts as a lever in turning the cylinder, is of glaſs. Thus every part of the machine is inſulated, the cylinder itſelf and its braſs caps not excepted; by which means the leaſt quantity poſſible of electric fluid is diſſipated, and hence of courſe the effects are likely to be the more powerful. And to this the inventor has adapted ſome flexible conducting joints, a diſcharging electrometer, and other utenſils neceſſary for the practice of medical electricity.

35
Great machine at Teyler's muſeum.

To theſe deſcriptions of electrical machines, we ſhall add that of a very large and powerful one in Teyler's Muſeum at Haarlem, and which was conſtructed by one Mr John Cuthbertſon, an Engliſh mathematical inſtrument-maker. It conſiſts of two circular plates of glaſs, each 65 inches in diameter, and made to turn upon the ſame horizontal axis, at the diſtance of 7½ inches from one another. Theſe plates are excited by eight rubbers, each 15½ inches long. Both ſides of the plates are covered with a reſinous ſubſtance to the diſtance of 16½ inches from the centre, both to render the plates ſtronger, and likewiſe to prevent any of the electricity from being carried off by the axis. The prime conductor conſiſts of ſeveral pieces, and is ſupported by three glaſs pillars 57 inches in length. The plates are made of French glaſs, as this is found to produce the greateſt quantity of the electricity next to Engliſh flint, which could not be produced of ſufficient ſize. The conductor is divided into branches which enter between the plates, but collect the fluid by means of points only from one ſide of the plate. The force of two men is required to work this machine; but when it is required to be put in action for any length of time, four are neceſſary. At its firſt conſtruction nine batteries were applied to it, each having 15 jars, every one of which contained about a foot ſquare of coated glaſs; ſo that the grand battery formed by the combination of all theſe contained 135 ſquare feet. The effects of this machine were aſtoniſhing, as ſhall be mentioned in its proper place: but Dr Van Marum, who principally made experiments with it, imagining that it was ſtill capable of charging an additional quantity of coated glaſs, afterwards added to it 90 jars of the ſame ſize with the former; ſo that it now contains a coated ſurface of 225 feet, and the effects are found to be proportionable.

We come now to deſcribe ſome of the other parts of an electrical apparatus, and which, though not eſſentially neceſſary for exciting the property called *electricity*, are abſolutely ſo for communicating it from one body to another, and performing many experiments which the machines themſelves, however powerful, could not accompliſh. Of theſe, the firſt we ſhall deſcribe is that called the *diſcharger*; by which the electricity, whether poſitive or negative, collected upon one body, may be ſuddenly transferred from it to another; which is called *diſcharging* the electricity of the former, if only one body be perceptibly electrified; or of both, if the one contain poſitive and the other negative electricity.

36
Diſcharger of electricity deſcribed.

Plate CLXXIV.

Fig. 8. repreſents Mr Henley's univerſal diſcharger; an inſtrument of very extenſive uſe in forming communications between jars or directing the ſhock through any particular ſubſtance. *AB* is a flat board 15 inches long, 4 broad, and 1 thick, and forming the baſis of the inſtrument. *DC* are two glaſs pillars cemented in two holes upon the board *AB*, and furniſhed at their tops with braſs caps; each of which has a turning joint, and ſupports a ſpring tube, through which the wires *EF* and *ET* ſlide. Each of theſe caps is compoſed of three pieces of braſs, connected with each other in ſuch a manner, that the wire *EF*, beſides its ſliding through the ſocket, has two other motions, viz. an horizontal one and a vertical one. Each of the wires is furniſhed with an open ring at one end, and at the other has a braſs ball; which, by a ſhort ſpring ſocket, is ſlipped upon its pointed extremity, and may be removed from it at pleaſure. *HG* is a ſtrong circular piece of wood five inches diameter, having a ſlip of ivory inlaid on its ſurface, and furniſhed with a ſtrong cylindric foot, which fits the cavity of the ſocket *I*. This ſocket is fixed in the middle of the bottom board, and has a ſcrew at *K*; by which the foot of the circular board is made faſt at any required height.

Fig. 9. is a ſmall preſs belonging to this inſtrument. It conſiſts of two oblong pieces of wood,

which are forced together by the two ſcrews *aa*. The lower end has a cylindrical foot equal to that of the circular table *H*. When this preſs is to be uſed, it muſt be fixed into the ſocket *I*, in place of the circular board *HG*; which in that caſe is to be removed.

37 Electrical jar or Leyden phial

Fig. 10. ſhows an electrical jar or Leyden vial, for the purpoſes chiefly of giving a ſhock, or of accumulating a quantity of electricity in ſuch a manner as could not be done in any other way, without uſing an immenſe extent of electrified ſurface. It is coated on the inſide with tin-foil to the height of about three inches below the top of the cylindrical part of the glaſs; and having a wire with a round braſs knob at its extremity, which paſſes through the middle of a piece of wood *D*, is uſed as a ſtopper for the bottle. Its lower end is uſually connected with the inſide coating by means of a piece of chain or ſlender wire.

38 Electrical battery

Fig. 11 ſhows the moſt approved conſtruction of an *electrical battery;* a part of the apparatus which takes its name from its conſtruction and formidable effects. It conſiſts of a number of coated jars, placed in ſuch a manner that they may all be charged at the ſame time, and diſcharged in an inſtant; ſo that the whole power of electricity accumulated in them may be at once exerted upon the ſubſtance expoſed to the ſhock. The battery repreſented in the figure conſiſts of nine jars connected together by the wires *a, b, c, d, e, f, g, h, i;* all of which are faſtened into the wood-ſtoppers of the bottles, and meet at top in the braſs ball. Thus a communication is made between all the inſide coatings of the jars, while their outſide coatings are connected by the bottom of the box on which they ſtand; and which, that it may conduct the better, is covered with tin foil. In one ſide of the box near the bottom is an hole through which a braſs hook paſſes, and which communicates with the metallic lining of the box, and conſequently with the outſide coating of the jars. To this hook a wire or chain is occaſionally connected when a diſcharge is made; and for the more convenient making of this diſcharge, a ball and wire *B* proceed to a convenient length from the centre ball *A*. When the whole force of the battery is not required, one, two, or three jars may be removed only by preſſing down the wires belonging to them, until their extremities can ſlip out of their reſpective holes in the braſs ball, and then turning them into ſuch a poſture that they cannot have any communication with the battery. The number of jars repreſented in this figure is rather ſmall for ſome purpoſes; but it is better to join two or three ſmall batteries together rather than have a ſingle large one, which is inconvenient on account of its weight and unwieldineſs.

The conſtruction of jars and batteries is part of the buſineſs of an electrician; and he ought to be expert in coating the vials himſelf, not only becauſe of the expence attending the employment of others, but becauſe he may ſometimes be at too great a diſtance from workmen who are accuſtomed to operations of this kind. A conſiderable difficulty ariſes with reſpect to the ſize of the jars and the kind of glaſs they are to be made of. Fine flint or cryſtal glaſs may probably be made uſe of with greater advantage than any other; but the expence here becomes a very conſiderable object, eſpecially as the jars of a battery are very apt to break by reaſon of the inequality of their ſtrength; for it would ſeem that the force of the fluid in a battery is equally diſtributed among all the bottles, without any regard to their capacities of receiving a charge ſingly conſidered. Thus, if we expreſs the quantity of charge which one jar can eaſily receive by the number 10, we ought not to combine ſuch a jar in a battery with another whoſe capacity is only 8; becauſe the whole force of electricity expreſſed by 10 will be directed alſo againſt that whoſe capacity is only 8; ſo that the latter will be in danger of being broken. It will be proper, therefore, to compare the bottles with one another in this reſpect before putting them together in a battery. Beſides the conſideration of the abſolute capacity which each bottle has of receiving a charge, the time which is taken up in charging it muſt alſo be attended to; and the jars of a battery ought to be as equal as poſſible in this reſpect as well as in the former. The thinner a glaſs is, the more readily it receives a charge, and *vice verſa;* but it doth not follow from thence, as electricians in general imagined till lately, that, on account of its thinneſs, it is capable of containing a greater charge than a thicker one. The reverſe is actually the caſe: and though a thick glaſs cannot be charged in ſuch a ſhort time as a thin one, it is nevertheleſs capable of containing a greater power of electricity. If the thickneſs of the glaſs be very great, no charge can indeed be given it; but experiments have not yet determined how great the thickneſs muſt be which will prevent any charge. Indeed it is obſerved, that though a thick glaſs cannot be charged by a weak electric machine, it may be ſo by a more powerful one; whence it ſeems reaſonable to ſuppoſe that there is no real limit of this kind; but that if machines could be made ſufficiently powerful, glaſſes of any thickneſs might be charged.

39 Why the jars of a battery are ſometimes apt to break.

40 Mr Brookes's method of conſtructing batteries.

Mr Brookes, an ingenious electrician of Norwich, conſtructed his batteries, which appear to have been very powerful, of green-glaſs bottles. Some of them, like that repreſented in the figure, had only nine of theſe bottles; but when a greater power was wanted, more were added. Jars would have been preferred to bottles on account of their being more eaſily coated by reaſon of their wide mouths; but being leſs eaſily procured, he was content to put up with this inconvenience. The mean ſize of theſe bottles was about eight inches in diameter; they were coated 10 inches high, and made of the thickeſt and ſtrongeſt glaſs that could be procured, weighing from five pounds and an half to ſeven pounds each. In the conſtruction of a battery of 27 bottles, he diſpoſed of them in three rows; nine of the ſtouteſt and beſt compoſing the firſt row, nine of the next in ſtrength being diſpoſed of in the ſecond, and the third containing the nine weakeſt. All of theſe were of green glaſs, but not of the ſame kind. Some which ſtood in the foremoſt row were compoſed of a kind very like that of which Frontiniac wine-bottles are made: and our author remarks, that this kind of glaſs ſeems to be by much the beſt, as being both harder and ſtronger, and leſs liable to break by an high charge. The ſecond and third rows of the battery conſiſted of bottles whoſe diameter was from ſix and an half to ten inches, and which were coated from eight and an half to eleven inches high; none of their mouths being larger than an pparatus

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an inch and an half, nor leſs than three quarters of an inch. In caſe any of the bottles being broken by the diſcharge of the battery, Mr Brookes found that it could be mended in ſuch a manner as to become ſerviceable by a cement made according to the following receipt: "Take of Spaniſh-white eight ounces; heat it very hot in an iron ladle, to evaporate all the moiſture; and when cool, ſift it through a lawn ſieve: add three ounces of pitch, three quarters of an ounce of roſin, and half an ounce of bees-wax: heat them all together over a gentle fire, ſtirring the whole frequently for near an hour; then take it off the fire, and continue the ſtirring till it is cold and fit for uſe." The bottles cemented with this compoſition, however, were not judged to be ſufficiently ſtrong to ſtand in their original place, but were removed to the ſecond or third row, as it was apprehended they could beſt ſuſtain the charge. All the bottles of this battery, as well as the ſingle ones he commonly made uſe of in his experiments, were coated both on the inſide and outſide with ſlips of tin-foil from three-eighths to three-fourths of an inch wide, laid on with paſte of flour and water, at the diſtance of about the breadth of a ſlip between each.

Fig. 12. repreſents the inſulating ſtool, a very uſeful part of the apparatus, eſpecially for medical purpoſes, where it is often neceſſary to inſulate the human body. In theſe caſes it is proper to have it of a magnitude ſufficient to hold a chair or other ſeat, on which the patient may ſit during the operation. The ſtool itſelf may be conveniently conſtructed of a mahogany board with glaſs feet varniſhed, as already directed. When in uſe, the inſulation will be the more perfect that a piece of dry paper be put upon it.

Theſe are the parts of the electrical apparatus eſſentially neceſſary for exhibiting the ordinary experiments; but as many very curious phenomena are to be obſerved in different ſubſtances, without uſing any part of the apparatus above deſcribed, we ſhall next proceed to give an account of thoſe bodies which naturally exhibit ſigns of electricity, with the various phenomena attending them.

## SECT. IV. *A Catalogue of the different Electric Subſtances, with the general Phenomena attending their Excitation.*

THE liſt of ſubſtances by which electric phenomena may be produced, is ſo very extenſive, that it may perhaps be doubted whether all terreſtrial matters, metals and charcoal only excepted, may not be included in the number. Some, however, have the property much more, or exhibit particular phenomena more obviouſly, than others; and according to this we may divide them into claſſes, as ſhall afterwards be more particularly noticed. The following catalogues enumerate thoſe in which the property in general has been diſcovered.

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Phenomena.

| Electric ſubſtances. | Quality of electricity. | Subſtances with which the electric is rubbed |
|---|---|---|
| The back of a cat. | Poſitive | Every ſubſtance hitherto tried. |
| Smooth glaſs | Poſitive | Every ſubſtance, except the back of a cat. |
| Rough glaſs | Poſitive | Dry oiled ſilk, ſulphur, or metals. |
| | Negative | Woollen-cloth, quills, wood, paper, ſealing-wax, white-wax, the human hand. |
| Tourmalin | Poſitive | Amber, or air blown upon it. |
| | Negative | Diamond, the human hand. |
| Hare's ſkin | Poſitive | Metals, ſilk, loadſtone, leather, hand, paper, baked wood. |
| | Negative | Other finer furs. |
| Black ſilk | Poſitive | Sealing-wax. |
| | Negative | Hare's, weaſel's, and ferret's ſkin, loadſtone, braſs, ſilver, iron, hand. |
| White ſilk | Poſitive | Black ſilk, metals, black cloth. |
| | Negative | Paper, hand, hare's, weaſel's ſkin. |
| Sealing-wax | Poſitive | Metals. |
| | Negative | Hare's, weaſel's, and ferret's ſkin, hand, leather, woollen-cloth, paper. |
| Baked wood | Poſitive | Silk. |
| | Negative | Flannel. |

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This table contains moſt of thoſe ſubſtances that exhibit the ſtrongeſt marks of electricity. The following is compoſed by Mr Henley, and contains a great number of ſubſtances whoſe electricity is much more equivocal. They were fixed or tied on the end of a ſtick of ſealing-wax; and excited by friction againſt a woollen garment, or a piece of ſoft black ſilk, by which means they became electrified as below. The ſtrongeſt in power are diſtinguiſhed by the letter s, and the weakeſt by the letter w.

### METALS.

| | Wool. | Silk. |
|---|---|---|
| A new guinea; a ſmooth ſixpence; a braſs ferule; tin, and tin-foil; enamelled copper, s; gilding on leather, s; lead ore; copper ore; iron ore; ſtream tin. | Neg. | Neg. |
| Milled lead; copper, s; a poliſhed ſteel button, s; a new ſilver ditto; a metal button gilt, s; tutenague ditto, s; iron. | Poſ. | Poſ. |
| Lead from a tea-cheſt, in which there is a mixture of tin, w. | Neg. | Poſ. |
| A gilt button, baſket-pattern; the juncture at the end of a braſs ferule. | Poſ. | Neg. |

### ANIMAL SUBSTANCES.

Tortoiſe-ſhell, w; ivory, s; bone, s; horn; lamb's-tooth; horſe's-hoof; deer's-hoof; muſcle of the leg of a deer, s; cartilage, s; ſpur of a young cock; bill, claw, and ſcale from the leg of

| | Wool. | Silk. |
|---|---|---|
| of a turkey, s; ſcale of a carp; the *chryſalis* of a moth, recent from the earth, cleanſed; *craſſamentum* of the human blood exſiccated, w; quills; claw of an unboiled lobſter; cowrie and ſeveral other ſmooth ſhells, s; ſhell of a hen's egg; tail of a ſmall fiſh; thigh of the elephant beetle; a ſmall beetle, ſmooth ſurface; human hair; red and white horſe's and bullock's hair, s; hog's briſtles, s; wool; ſilk from the worm, w; oyſter-ſhell, ſmooth ſurface; | Poſ. | Poſ. |
| Mother of pearl, and ſeveral other ſhells. | Neg. | Poſ. |
| Muſcle and cockle-ſhells, recent; a recent ſnail-ſhell, rough ſurface; *elytra* of the ſtag-beetle; oyſter-ſhell, rough ſurface. | Neg. | Neg. |
| **Vegetables.** | | |
| Rind of cheſtnut, s; Barcelona nut-ſhell, s; caſhew nut, s; cocoa nut-ſhell poliſhed; Brazil; *lignum vitæ;* black ebony, s; box, w; cane, s; *quinquina*, or Peruvian bark, s; tamarind ſtone; coffee-berry roaſted, s; nutmeg, s; ginger, s; white pepper, freed from the huſk, s; cinnamon, s; cloves, s; mace, s; all-ſpice, s; capſicum, both ſides of the pod, s; hemlock, s; a clove of garlic; ditto of eſchalot, freed from the huſk, s; a green onion, s; rue, s; cork, s; leaves of laurel, bay, yew, holly, roſemary, with their berries, s; parſley, s; leaf of turnip; ditto of Savoy cabbage, s; celery, s; ſago, s; thime, s; carrot; turnip; potato; an acorn, s; rind of Seville orange, s; a large Windſor bean, s; a white pea; root of the white lily; ſnow-drop root; ſeeds of gourd, melon, cucumber, w; a ſpecies of long moſs, w; an apple, s; down of the cotton-ruſh, w; ſea flag; leaf of the American aloe, s; cotton, w. | Neg. | Neg. |
| Hemp; flax; ſtalk of the tobacco-leaf: ſpike, from the leaf of the American aloe; *palma-chriſti* nut; horſe-radiſh. | Neg. | Poſ. |
| A white kidney-bean, ſmooth ſurface; black negroe of the ſame; ſcarlet of the ſame. | Poſ. | Poſ. |
| **Corallines.** | | |
| Sea-fan, the horny part, w; rough coral, w. | Neg. | Poſ. |
| Spunge, w; coral poliſhed, w. | Neg. | Poſ |
| **Salts.** | | |
| Alum, w. - - | Neg. | Neg. |
| *Borax*,<br>Nitre purified, } Smooth ſurfaces; | Poſ. | Poſ. |
| **Fossil and Mineral Substances.** | | |
| Common pebble-ſtones of all colours, s; marble, s; pit-coal, s; black-lead, w; jet, s; *aſbeſtos*; mineralized ſulphur; thunder-bolt ſtone; *cornu-ammonis;* ſhark's-tooth; coat of petrifaction. | Neg. | Neg. |
| Several ſmooth native cryſtals; brown Iceland ditto; *talc*, s; Ceylon pebble, ſmooth and tranſparent; agate, s; cornelian; amethyſt, s. | Poſ. | Poſ. |
| A ſpecimen of *gypſum*. | Neg. | Poſ. |
| **Artificial Substances.** | | |
| Staffordſhire ware glazed; China ware, s; Wedgwood's ware glazed, s; whale's fin prepared, w; writing-paper; parchment, s; ſheep's gut. | Poſ. | Poſ. |
| Tobacco-pipe, s; Wedgwood's ware unglazed; elaſtic gum, s; hard under-cruſt of a leaf; a tallow-candle, w: oiled ſilk; painted paper, s; ſilver, burnt into glaſs, unburniſhed; pearl-barley, w; Indian ink, w; blue vitriol, s. | Neg. | Neg. |
| Dr Lewis's glaſs porcelain. | Neg. | Poſ. |

Here it muſt be obſerved, that a great number of the ſubſtances in Mr Henley's table, particularly metals, would have been totally incapable of excitation had they not been inſulated; and as they were rubbed againſt electrics *per ſe*, it is by no means fair to conclude that the metal was *excited*. It ſeems much more likely that the rubber only was excited, and communicated its electricity to the metal. It muſt alſo be obſerved, that though there is a very remarkable difference between ſubſtances with regard to their non-electric or conducting power, yet there ſeems not to be a perfect electric in nature: for heat will deſtroy the electric power of glaſs, and every other ſubſtance; and, on the contrary, cold, if not attended with moiſture, renders every electric ſubſtance more electric than before. The uſe of warming an electric therefore, before excitation, is only to free it from the moiſture which may adhere to it.

From the above catalogues it will readily be apprehended, that the powers of the electric ſubſtances not only vary prodigiouſly from one another, but likewiſe according to the circumſtances in which they are placed. Thus alſo we find, that, according to the different ſubſtances made uſe of, we may ſometimes produce one phenomenon and ſometimes another, in a manner excluſive of all the reſt. Hence we have a foundation for claſſing electric ſubſtances according to the various powers they occaſionally exhibit, and which we ſhall do in the following manner.

1. Thoſe which exhibit a ſtrong and permanent attractive and repulſive power; of which the moſt remarkable is ſilk.

2. For exhibiting the electric light, attraction and repulſion, and all the other phenomena of electricity in a very vigorous though not durable manner, glaſs is preferable to all other bodies.

3. Thoſe which exhibit electric appearances for a great length of time, and which communicate to conducting bodies the greateſt electric power. Of theſe the ſubſtances called *negative electrics* are the moſt remarkable;

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markable; ſuch as amber, gum-lac, roſin, ſulphur, &c. on the properties of which depend the phenomena of the electrophorus, to be afterwards deſcribed.

4. Thoſe which readily exhibit electrical phenomena by heating and cooling, of which the principal is the tourmalin.

### § 1. *Of the Electrical Phenomena from Silk.*

THIS ſubſtance was firſt diſcovered to be an electric by Mr Grey, in the manner we have already related*; but as it was by no means remarkable for emitting ſparks, which moſt commonly engages the attention, its electric virtues were almoſt entirely overlooked till the year 1759. At that time Mr Symmer preſented to the royal ſociety ſome papers, containing a number of very curious experiments made with ſilk ſtockings, in ſubſtance as follows.

* See n° 5.

He had been accuſtomed to wear two pairs of ſilk ſtockings; a black and a white. When theſe were put off both together, no ſigns of electricity appeared; but on pulling off the black ones from the white, he heard a ſnapping or crackling noiſe, and in the dark perceived ſparks of fire between them. To produce this and the following appearances in great perfection, it was only neceſſary to draw his hand ſeveral times backward and forward over his leg with the ſtockings upon it.

45 o: g at- ction and ulſion ween e- trified ckings.

When the ſtockings were ſeparated and held at a diſtance from each other, both of them appeared to be highly excited; the white ſtocking poſitively, and the black negatively. While they were kept at a diſtance from each other, both of them appeared inflated to ſuch a degree, that they exhibited the entire ſhape of the leg. When two black or two white ſtockings were held in one hand, they would repel one another with conſiderable force, making an angle ſeemingly of 30 or 35 degrees. When a white and black ſtocking were preſented to each other, they were mutually attracted; and if permitted, would ruſh together with ſurpriſing violence. As they approached, the inflation gradually ſubſided, and their attraction of foreign objects diminiſhed, but their attraction of one another increaſed; when they actually met, they became flat, and joined cloſe together like as many folds of ſilk. When ſeparated again, their electric virtue did not ſeem to be in the leaſt impaired for having once met; and the ſame appearances would be exhibited by them for a conſiderable time. When the experiment was made with two black ſtockings in one hand, and two white ones in the other, they were thrown into a ſtrange agitation, owing to the attraction between thoſe of different colours, and the repulſion between thoſe of the ſame colour. This mixture of attractions and repulſions made the ſtockings catch at each other at greater diſtances than otherwiſe they would have done, and afforded a very curious ſpectacle.

When the ſtockings were ſuffered to meet, they ſtuck together with conſiderable force. At firſt Mr Symmer found they required from one to 12 ounces to ſeparate them. Another time they raiſed 17 ounces, which was 20 times the weight of the ſtocking that ſupported them; and this in a direction parallel to its ſurface. When one of the ſtockings was turned inſide out, and put within the other, it required 20 ounces to ſeparate them; though at that time 10 ounces were ſufficient when applied externally. Getting the black ſtockings new dyed, and the white ones waſhed, and whitened in the fumes of ſulphur, and then putting them one within the other, with the rough ſides together, it required three pounds three ounces to ſeparate them. With ſtockings of a more ſubſtantial make, the coheſion was ſtill greater. When the white ſtocking was put within the black one, ſo that the outſide of the white was contiguous to the inſide of the black, they raiſed nine pounds wanting a few ounces; and when the two rough ſurfaces were contiguous, they raiſed 15 pounds one pennyweight and a half. Cutting off the ends of the thread and the tufts of ſilk which had been left in the inſide of the ſtockings, was found to be very unfavourable to theſe experiments.

Mr Symmer alſo obſerved, that pieces of white and black ſilk, when highly electrified, not only cohered with each other, but would alſo adhere to bodies with broad and even poliſhed ſurfaces, though theſe bodies were not electrified. This he diſcovered accidentally; having, without deſign, thrown a ſtocking out of his hand, which ſtuck to the paper-hangings of the room. He repeated the experiment, and found it would continue hanging near an hour. Having ſtuck up the black and white ſtockings in this manner, he came with another pair highly electrified; and applying the white to the black, and the black to the white, he carried them off from the wall, each of them hanging to that which had been brought to it. The ſame experiments held with the painted boards of the room, and likewiſe with the looking-glaſs, to the ſmooth ſurface of which both the white and the black ſilk appeared to adhere more tenaciouſly than to either of the former.

44 Experiments on ribbons by Mr Cigna.

Similar experiments, but with a greater variety of circumſtances, were afterwards made by Mr Cigna of Turin, upon white and black ribbons. He took two white ſilk ribbons juſt dried at the fire, and extended them upon a ſmooth plain, whether a conducting or electric ſubſtance was a matter of indifference. He then drew over them the ſharp edge of an ivory ruler, and found that both ribbons had acquired electricity enough to adhere to the plain; though while they continued there, they ſhowed no other ſign of it. When taken up ſeparately, they were both negatively electrified, and would repel each other. In their ſeparation, electric ſparks were perceived between them; but when again put on the plain, or forced together, no light was perceived without another friction. When by the operation juſt now mentioned they had acquired the negative electricity, if they were placed, not upon the ſmooth body on which they had been rubbed, but on a rough conducting ſubſtance, they would, on their ſeparation, ſhow contrary electricities, which would again diſappear on their being joined together. If they had been made to repel each other, and were afterwards forced together, and placed on the rough ſurface above mentioned, they would in a few minutes be mutually attracted; the lowermoſt being poſitively, and the uppermoſt negatively electrified.

If the two white ribbons received their friction upon the rough ſurface, they always acquired contrary electricities. The upper one was negatively, and the lower one poſitively electrified, in whatever manner they were taken off. The ſame change was inſtantaneouſly done by any pointed conductor. If two ribbons, for inſtance, were made to repel, and the point

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of a needle drawn oppoſite to one of them along its whole length, they would immediately ruſh together.

The ſame means which produced a change of electricity in a ribbon already electrified, would communicate electricity to one which had not as yet received it; viz. laying the unelectrified ribbon upon a rough ſurface, and putting the other upon it; or by holding it parallel to an electrified ribbon, and preſenting a pointed conductor to it. He placed a ribbon that was not quite dry under another that was well dried at the fire, upon a ſmooth plain: and when he had given them the uſual friction with his ruler, he found that in what manner ſoever they were removed from the plain, the upper one was negatively and the lower one poſitively electrified.—If both ribbons were black, all theſe experiments ſucceeded in the ſame manner as with the white. If, inſtead of the ivory ruler, he made uſe of any ſkin or a piece of ſmooth glaſs, the event was the ſame; but if he made uſe of a ſtick of ſulphur, the electricities were in all caſes the reverſe of what they had been before the ribbons were rubbed, having always acquired the poſitive electricity. When he rubbed them with paper either gilt or not gilt, the reſults were uncertain. When the ribbons were wrapped in paper gilt or not gilt, and the friction was made upon the paper laid on the plain above mentioned, the ribbons acquired both of them the negative electricity. If the ribbons were one black and the other white, whichever of them was laid uppermoſt, and in whatever manner the friction was made, the black generally acquired the negative and the white the poſitive electricity.

He alſo obſerved, that when the texture of the upper piece of ſilk was looſe, yielding, and retiform like that of a ſtocking, ſo that it could move and be rubbed againſt the lower one, and the rubber was of ſuch a nature as could communicate but little electricity to glaſs, the electricity which the upper piece of ſilk acquired did not depend upon the rubber, but upon the body on which it was laid. In this caſe, the black was always negative and the white poſitive But when the ſilk was hard, rigid, and of a cloſe texture, and the rubber of ſuch a nature as would have imparted a great degree of electricity to glaſs, the electricity of the upper piece depended on the rubber. Thus, a white ſilk ſtocking rubbed with gilt paper upon glaſs became negatively, and the glaſs poſitively, electrified. But if a piece of ſilk of a firmer texture was laid upon a plate of glaſs, it was *always* electrified poſitively, and the glaſs negatively, if it was rubbed with ſulphur, and for the moſt part if it was rubbed with gilt paper.

If an electrified ribbon was brought near an inſulated plate of lead, it was attracted, but very feebly. On bringing the finger near the lead, a ſpark was obſerved between them. the ribbon was vigorouſly attracted, and both together ſhowed no ſigns of electricity. On the ſeparation of the ribbon, they were again electrified, and a ſpark was perceived between the plate and the finger.

When a number of ribbons of the ſame colour were laid upon a ſmooth conducting ſubſtance, and the ruler was drawn over them, he found, that when they were taken up ſingly, each of them gave ſparks at the place where it was ſeparated from the other, as did alſo the laſt one with the conductor; and all of them were negatively electrified. If they were all taken from the plate together, they cohered in one maſs, which was negatively electrified on both ſides. If they were laid upon the rough conductor, and then ſeparated ſingly, beginning with the lowermoſt, ſparks appeared as before, but all the ribbons were electrified poſitively, except the uppermoſt.—If they received the friction upon the rough conductor, and were all taken up at once, all the intermediate ribbons acquired the electricity, either of the higheſt or loweſt, according as the ſeparation was begun with the higheſt or the loweſt. If two ribbons were ſeparated from the bundle at the ſame time, they clung together, and in that ſtate ſhowed no ſign of electricity, as one of them alone would have done. When they were ſeparated, the outermoſt one had acquired an electricity oppoſite to that of the bundle, but much weaker.

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A number of ribbons were placed upon a plate of metal to which electricity was communicated by means of a glaſs globe, and a pointed conductor held to the other ſide of the ribbons. The conſequence was, that all of them became poſſeſſed of the electricity oppoſite to that of the plate, or of the ſame, according as they were taken off; except the moſt remote, which always kept an electricity oppoſite to that of the plate.

### § 2. *Of the Phenomena produced by excited or electrified Glaſs.*

THAT glaſs is an electric ſubſtance, was firſt diſcovered by Dr Gilbert. It was for a long time, however, thought to poſſeſs but a very weak electric virtue; though now it is found to be one of the beſt, if not the very beſt, electric as yet known. Notwithſtanding the many experiments made upon this ſubſtance, it is not yet aſcertained what kind of glaſs is moſt proper for electrical purpoſes. It has been obſerved, that the hardeſt and moſt completely vitrified glaſs is often a very bad electric, being ſometimes quite a conductor. Glaſs veſſels made for electrical purpoſes are often rendered fit for them by uſe and time, though very bad electrics when new. Mr Bergman of Upſal ſays, that very often, when his glaſs globes could not be excited to a ſufficient degree of ſtrength, he lined them with a thin coating of ſulphur, and that then they gave a much ſtronger poſitive electricity than before. In Italy, and other places, according to Mr Nollet, it is the cuſtom of electricians to put a coating of pitch or other reſinous matter on the inſide of their globes, which they ſay always makes them work well. He gives the preference to the cryſtal glaſs of England, Bohemia, &c. It ſeems doubtful, however, whether the common bottle glaſs does not anſwer equally well, or even better.

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The moſt remarkable phenomenon producible by excited glaſs is that of the Leyden vial. It depends entirely upon the following property of glaſs, viz. that it is impoſſible to electrify the outſide of a glaſs poſitively, at leaſt to any conſiderable degree, without at the ſame time electrifying the inſide of it negatively: in like manner, it is impoſſible to electrify the outſide negatively; without at the ſame time electrifying the inſide poſitively. It is alſo the nature of glaſs and all other electric ſubſtances, when once electrified either by excitation or communication,

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explained.

munication, to part with their electricity very ſlowly and gradually. Thus, ſuppoſing a tube, cylinder, or plate of glaſs, to be highly electrified; if a finger is brought near any part of it, a ſpark will be felt to ſtrike the finger with a ſnapping noiſe. Part of the electricity will then be diſcharged from the glaſs, but not all. If the finger is brought near another part of the glaſs, a ſimilar ſpark will be again produced; and ſo on, by moving the finger to different parts of the glaſs, till all its electricity is exhauſted. It is the nature of conducting ſubſtances to diſcharge all their electricity at once, by a ſingle ſpark, if another conducting ſubſtance is brought near them. This being the caſe, therefore, it follows, that if every part of one ſide of a glaſs plate is covered over with a conducting ſubſtance, every point of the glaſs will give out its electricity to the conductor; and conſequently, if another conducting ſubſtance is brought near to that by which the glaſs is covered, the whole electric power in the glaſs ought to be diſcharged in one ſingle flaſh or large ſpark.

This would no doubt be the caſe, if it was poſſible to electrify the glaſs only on one ſide. But this is found to be impoſſible. No method hath yet been found of electrifying one ſide of a piece of glaſs poſitively, without electrifying the other negatively at the ſame time. There is therefore a neceſſity for taking off the electricity from both ſides of the glaſs at the ſame time. This can only be done by covering both ſides of the glaſs with a conducting ſubſtance, and preſenting other conductors to both ſides at the ſame time: then the electricity of both is diſcharged in an inſtant. A ſtrong ſpark is perceived between both ſides of the coated glaſs and the conducting ſubſtances; and if a perſon holds one in each hand, he will, at the inſtant of the diſcharge, feel a very diſagreeable ſenſation, which cannot well be deſcribed, in his arms and breaſt: and this is ſaid to be receiving the *electric ſhock*.

If, inſtead of preſenting a conducting ſubſtance to both ſides of the plate at once, a finger is preſented to one ſide, ſuppoſe that which is poſitively electrified, and another ſubſtance very highly electrified poſitively is preſented to the negative ſide of the glaſs, a like diſcharge will enſue, but the ſhock will be much gentler than in the former caſe, and probably the electricity of the glaſs will not be all diſcharged. If two conducting ſubſtances, inſulated, ſuppoſe two cylinders of metal fixed upon ſticks of ſealing wax, or ſuſpended by ſilk threads, are brought to the ſides of the coated glaſs at the ſame time; each of them will receive a ſpark of poſitive or negative electricity, according as the ſide to which it was applied is poſitively or negatively electrified. When the metallic cylinders are taken away, they will communicate the electricity they have received to other bodies; and if again applied to the coated glaſs, they will receive ſparks as before; and thus the electricity of both ſides will be gradually diſcharged.

After the diſcharge has been once made, the glaſs is found in a ſhort time to recover its electricity, tho' in a ſmall degree. The ſide which was originally electrified poſitively, becomes electrified in the ſame manner the ſecond time, and ſo of the negative ſide. This ſecond electrification is called the *reſiduum* of a charge; and, where there is a large ſurface of coated glaſs, hath a very conſiderable degree of power. The ſame thing, which we have juſt now obſerved with regard to a flat ſurface of glaſs, takes place with tubes and vials, or glaſs veſſels of any kind; and it is always obſerved, that the thinneſt glaſs anſwers beſt for this purpoſe. The Leyden vial conſiſts of a glaſs vial, jar, or bottle, covered on the outſide and inſide with tin-foil, yet leaving an interval of two or three inches at top without any metallic covering, that the electricity of the one ſide may not be communicated to the other as faſt as it is collected. A more particular deſcription of it will be given when we ſpeak of the electric apparatus. The above will be ſufficient to render the following experiments intelligible.

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Experiments on glaſs plates by Mr Symmer.

Mr Symmer, when making the experiments we have already related, concerning the ſtrong coheſive power of electrified ſilk, was induced to try the coheſive power of electrified glaſs. For this purpoſe, he got two panes of common window-glaſs, the thinneſt and ſmootheſt he could meet with. He coated one of the ſides with tin-foil, leaving a ſpace uncovered near the edges. The uncovered ſides were then put together, and electricity communicated to one of the coatings by means of a machine. In conſequence of this, the other ſide, which was alſo coated, became electrified with an electricity oppoſite to the firſt, and both panes were charged with the electric power, as if they had been but one. After they had received a conſiderable degree of electric power, they cohered pretty ſtrongly together, but he had no apparatus by which the ſtrength of their coheſion could be meaſured. He then turned the plates upſide down; and diſcharging from his machine poſitive electricity upon the negative ſide of the glaſs, both panes were immediately diſcharged, and their coheſion ceaſed. Placing two panes of glaſs, each of them coated on both ſides, one upon the other, each of them had a poſitive and negative ſide, by communicating electricity to one of them, and they did not cohere.

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Experiments on glaſs plates by Mr Beccaria.

In conſequence of theſe experiments made by Mr Symmer, and another (which we ſhall preſently give an account of) made at Pekin, Mr Beccaria made the following ones. Having charged a coated plate of glaſs, he took off the coating from the negative ſide, and applied another uncoated and uncharged (or unelectrified) plate of glaſs cloſe to it. After this, putting a coating upon the uncharged glaſs (ſo that the whole reſembled one coated plate conſiſting of two laminæ), he made a communication between the two coatings. The conſequence of this was an exploſion, a diſcharge of the poſitive and negative electricity, and a coheſion of the plates. If the plates were ſeparated before the exploſion, after they had been in conjunction for ſome time, the charged plate was poſitive on both ſides, and the uncharged one negative on both ſides. If after the exploſion he ſeparated and joined them alternately, a ſmall circle of paper, placed under the uncharged plate, adhered to it upon every ſeparation, and was thrown off again upon every conjunction. This could be repeated even 500 times with once charging the plate. This is the experiment made at Pekin as above mentioned.

If, in theſe experiments, the charged plate was inverted, and the poſitive ſide applied to the uncharged plate, all the effects were exactly the reverſe of the former. If it was inverted ever ſo often, after remaining

ing ſome time in contact with the uncharged plate, it would produce a change in the electricity. In the dark, a light was always ſeen upon the ſeparation of theſe plates. Laying the two plates together like one, and coating the outſides of them, he diſcharged them both together; and at the diſtance of about four feet he diſtinguiſhed ſix of the coloured rings mentioned by Sir Iſaac Newton, all parallel to one another, and nearly parallel to the edge of the coating. At the angles of the coatings the rings ſpread to a greater diſtance. Where the coatings did not quite touch the glaſs, the rings bent inwards; and where the coatings adhered very cloſe, they retired farther from them. Upon diſcharging theſe two plates, the coloured rings vaniſhed, and the electric coheſion ceaſed with them. On ſeparating the plates before the exploſion; that which had received the poſitive electricity was poſitive on both ſides, and the other negative on both ſides. If they were ſeparated after the exploſion, each of them was affected in a manner quite the reverſe. Upon inverting the plates, that which was the thinner appeared to be poſſeſſed of the ſtronger electricity, and brought the other plate to correſpond with it. Charging the two plates ſeparately, and taking off two of the coatings, ſo that two poſitive or two negative ſides might be placed together, there was no coheſion nor exploſion. But joining a poſitive and a negative ſide, they immediately cohered; and a communication being formed on the outſide, there was an exploſion which increaſed the coheſion.

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By Mr Henley.

Mr Henley repeated theſe experiments with ſucceſs when he made uſe of plates of looking-glaſs, or window and crown glaſs; but when two plates of Nuremberg glaſs, commonly called *Dutch plates*, were uſed, the reſult was very different. Eeach of the plates, when ſeparated after charging, had a poſitive and a negative ſurface. When they were replaced, and a diſcharge made, by forming a communication between the two coatings, the electricity of all the ſurfaces was changed. It appeared, however, ſtill to be very ſtrong, and the plates continued to give repeated flaſhes of light when they were alternately cloſed, touched, and ſeparated, like the other plates abovementioned. If a clean, dry, uncoated plate of looking-glaſs was placed between the coated plates, either of looking-glaſs or crown-glaſs, before they were charged, that uncoated plate was always found, upon ſeparating them after charging, to be electrified negatively on both ſides; but if it was put between the Dutch plates, it acquired, like them, a poſitive and negative electricity.

The following obſervation of Mr Æpinus is very remarkable. He preſſed cloſe together two pieces of looking-glaſs, each containing ſome ſquare inches; and found, that when they were ſeparated, and not ſuffered to communicate with any conductor, they acquired a ſtrong electricity, the one poſitive and the other negative. When put together again, the electricity of both diſappeared; but not if either of them had been deprived of their electricity when they were aſunder; for in that caſe, the two, when united, had the electricity of the other.

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Conducting power of glaſs tubes.

Theſe are the moſt remarkable experiments that have been made with electrified flat plates of glaſs. Tubes of the ſame matter, however, afford a variety of curious phenomena of a different nature. One very remarkable one is the conducting power of new flint-glaſs, which is moſt eaſily perceived in tubes, and on which Dr Prieſtley makes the following obſervations. He ſeveral times got tubes made two or three yards long, terminating in ſolid rods. Theſe he took almoſt warm from the furnace, in the fineſt weather poſſible; and having immediately inſulated them, perceived that the electricity of a charged vial would preſently diffuſe itſelf from one end to the other; and this he thought would have been the caſe at any diſtance at which the experiment could have been made. When the ſame tubes were a few months older, the electricity could not be diffuſed along their ſurface farther than half a yard.

The diffuſive power of glaſs he thought proper to try in a different manner. A tube was procured of about three feet long, but of very unequal width. About three inches of the middle part of it were coated on both ſides. This coated part was afterwards charged, by communicating electricity to the inſide of it by means of a wire. The conſequence of this was, that not only the part through which the wire was introduced became ſtrongly electrical on the outſide, but at the oppoſite end, where there was neither coating nor wire, the fire crackled under the fingers as the tube was drawn through the hand, and a flame ſeemed continually to iſſue out at both ends, while it was at reſt and charged.—One end of this tube was broken and rough, the other was ſmooth.

Another tube was procured about three feet and an half in length, and very thin. It was about an inch in diameter, and cloſed at one end. Three inches of it were coated on both ſides, about nine inches below the mouth. This part being charged, the whole tube, to the very extremity of it, was ſtrongly electrical, crackling very loud when the hand was drawn along it, and emitting ſparks at about an inch diſtance all the way. After drawing the whole tube through the hand, all the electricity on the outſide was diſcharged; but, on putting a finger into the mouth, a light ſtreamed from the coating, both towards the finger and towards the oppoſite end of the tube. After this, all the outſide of the tube was become ſtrongly electrical as before; and this electricity might be taken off and recovered many times without charging the tube anew, only it was weaker each time.—Holding this tube by the coated part, and communicating electricity to the uncoated outſide, both ſides became charged; and, upon introducing a wire, a conſiderable exploſion was made. The diſcharge made the outſide ſtrongly electrical, and by taking off this electricity, the tube became ſenſibly charged. The reſiduum of theſe charges was very conſiderable; and, in one tube, there was a reſiduum after 20 or 30 diſcharges.

By being kept for ſix or ſeven months, moſt of the tubes employed in theſe experiments loſt the above-mentioned properties, and the electricity could no longer diffuſe itſelf upon their ſurfaces. At length they were all broken except one, which had been the moſt remarkable of the whole. With this old tube, the Doctor tried to repeat the above-mentioned experiments:

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ments; but to no purpoſe. He then took it to a glaſs-houſe; and having made it red all over, its diffuſive property was reſtored as before.

He then tried two other tubes which had been made about ſix weeks, but without being uſed during all that time, and they anſwered exactly as if they had been quite new. The charge from a ſmall coated part diffuſed itſelf all over the tube; ſo that, at the diſtance of a yard from the coating, it gave ſparks to the finger of an inch long. On this occaſion he obſerved, that when his finger was brought to the tube about two inches above the coating, a great quantity of the diffuſing electricity was diſcharged; and his whole arm was violently ſhocked. The old tube, after being heated as above mentioned, ſhowed a prodigious diffuſive power. Upon charging a ſmall coated part, the electricity was diffuſed to the end of the tube; and it gave ſparks at the diſtance of an inch over every part of it. When it was drawn through the hand, in order to take off the diffuſed electricity, it inſtantly returned again, and the extremity of the tube would be highly electrified, even while its communication with the coating was cut off by the hand. The middle part of the tube alſo, which had been ofteneſt heated, had a much greater diffuſive power than any other. It was no ſooner taken off, than it appeared again; ſo that it gave a continual ſtream of fire. The quantity of reſiduum after a diſcharge of this tube was prodigious; ſo that the outſide coating would immediately after give almoſt a conſtant ſtream of fire for ſome time to any conducting ſubſtance placed near it.

The Doctor alſo obſerved, that in all the tubes which had the diffuſion, there was a conſiderable noiſe at the orifice when his hand was drawn from the extremity towards the coating, as if the tube had been gradually diſcharging itſelf. In the dark, the electric matter ſeemed perpetually to pour from the open end, or both ends if they were open; and whenever his hand was drawn over it, the fire ſtreamed from the coating to his hand in a very beautiful manner. The firſt time he charged any of theſe tubes after they had ſtood a while, the diffuſion was the moſt remarkable. It was leſſened by every ſucceſſive charge, and at laſt became exceedingly ſmall; but after the tube had ſtood a few hours uncharged, it was as vigorous as ever.

Mr Cavallo hath alſo made ſome curious diſcoveries concerning glaſs-tubes. He took the hint from obſerving accidentally, that by agitating quickſilver in a glaſs tube hermetically ſealed, and in whoſe cavity the air was very much rarefied, the outſide of the tube was ſenſibly electrified. The electricity, however, was not conſtant, nor in proportion to the agitation of the quickſilver. In order to aſcertain the properties of theſe tubes, he conſtructed ſeveral of them, one of which is repreſented fig. 71. Its length was 31 inches, and its diameter ſomething leſs than half an inch. The quickſilver contained in it was about three fourths of an ounce; and in order to exhauſt it of air, one end of it was cloſed, while the quickſilver boiled in the other. Before this tube is uſed, it muſt be made a little warm and cleaned; then, holding it nearly horizontal, the quickſilver in it is ſuffered to run from one end to the other, by gently and alternately elevating and depreſſing its extremities. This operation immediately renders the outſide electrical; but with the following remarkable property, *viz.* that the end of the tube where the quickſilver actually ſtands is always poſitive, and all the remaining part of it negative. If elevating this poſitive end of the tube a little, the quickſilver runs to the oppoſite end which was negative, then the former inſtantly becomes negative, and the latter poſitive. The poſitive end has always a ſtronger electricity than the negative. If when one end of the tube, for inſtance *A*, is poſitive, *i. e.* when the quickſilver is in it, that electricity is not taken off by touching it; then, on elevating this end *A*, ſo that the quickſilver may run to the oppoſite end *B*, it appears negatively electrified in a very ſmall degree. If by depreſſing it again it is a ſecond time rendered poſitive, and that poſitive electricity is not taken off, then, on elevating the end *A* again, it appears poſitive in a ſmall degree. But if, whilſt it is poſitive, its electricity is taken off, then on being elevated, it appears ſtrongly negative. When about two inches of each extremity of this tube is coated with tin-foil, as repreſented in the figure, that coating renders the electricities at the extremities more perceptible, ſo that ſometimes they will give ſparks to a conductor brought near them. Tubes whoſe glaſs is about one-twentieth of an inch thick anſwer better for theſe experiments than any others.

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XVII.

Phenomena.

52
Durability of the electric virtue in glaſs.

We ſhall cloſe this account of the phenomena of excited glaſs, with ſome experiments which ſhow the durability of the electric virtue in that ſubſtance in certain circumſtances. Mr Canton procured ſome thin glaſs balls of about an inch and a half in diameter, with ſtems or tubes of eight or nine inches in length. He electrified them, ſome poſitively, and others negatively, on the inſide, and then ſealed them hermetically. Soon after, he found that they had loſt all ſigns of electricity: but holding them to the fire at the diſtance of five or ſix inches, they became ſtrongly electrical in a ſhort time, and more ſo as they cooled. Heating them frequently he found would diminiſh their power; but keeping one of them under water a week did not appear in the leaſt to impair it. That which he kept under water was charged on the 22d of September 1760, was heated ſeveral times before it was kept in water, and had been frequently heated afterwards; yet it ſtill retained its virtue to a conſiderable degree till the 31ſt of October following. The breaking of two of his balls gave him an opportunity of obſerving their thickneſs, which he found to be between ſeven and eight parts of a thouſand of an inch. The balls retained their virtue for ſix years, but in a leſs degree. Mr Lullin alſo found, that a glaſs tube charged and hermetically ſealed, would ſhow ſigns of electricity when heated.

The moſt remarkable inſtances of the continuance of this power in glaſs, however, are thoſe given by Mr Henly in the 67th volume of the Phil. Tranſ. One is, of a ſmall bottle, which ſhowed ſigns of electricity for 70 days after it had been charged, and ſtood in a cupboard all that time. The other is of a glaſs cylinder, which after excitation continued to ſhow very ſtrong ſigns of electricity from the 5th day of February to the 10th of March, though various methods had been uſed during that time to deſtroy the electric virtue. Theſe means always proved effectual when they were applied, and the cylinder for ſome time ſhowed

ſhowed no ſigns of electricity. They never failed, however, to return without any freſh excitation; and became ſtronger and weaker, nay, ſometimes quite vaniſhed and returned, without any viſible cauſe. In general, the electricity was weak when a fire was kept in the room, or when the door was kept open. When the wind blew from the north, the electricity was vigorous, and likewiſe after it had been for ſome time deſtroyed by flame. The cylinder, however, did not at all times retain its electric virtue for ſuch a length of time without excitation. Very often it would loſe all ſigns of electricity in 12 hours, and at other times in a fortnight, without returning till it was again excited.

### § 3. *The Phenomena of excited Sulphur, Gum-lac, Amber, Roſin, baked Wood*, &c.

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Experiments by Mr Wilcke, Æpinus, &c.

THE moſt remarkable property of theſe, as already mentioned, is the durability of their electric virtue when once excited. They are alſo capable of being excited by heat without any friction. This laſt property was diſcovered by Mr Wilcke, who diſtinguiſhes it by the name of *ſpontaneous electricity*. He melted ſulphur in an earthen veſſel, which he placed upon conductors: then, letting them cool, he took out the ſulphur, and found it ſtrongly electrical; but it was not ſo when it ſtood to cool upon electric ſubſtances. He then melted ſulphur in glaſs veſſels, whereby they both acquired a ſtrong electricity whether placed upon electrics or not; but a ſtronger in the former caſe than in the latter: they acquired a ſtronger virtue ſtill, if the glaſs veſſel was coated with metal. In theſe caſes, the glaſs was always poſitive and the ſulphur negative. It was particularly remarkable, that the ſulphur acquired no electricity till it began to cool and contract, and was the ſtrongeſt in the greateſt ſtate of contraction; whereas the electricity of the glaſs was, at the ſame time, the weakeſt; and was the ſtrongeſt of all when the ſulphur was ſhaken out before it began to contract, and acquired any negative electricity.

Purſuing experiments of this kind, he found, that melted ſealing-wax poured into glaſs acquired a negative electricity, but poured into ſulphur a poſitive one, leaving the ſulphur negative. Sealing-wax alſo, poured into wood, was negative, and the wood poſitive; but ſulphur poured into ſulphur, or into rough glaſs, acquired no electricity at all.

Similar experiments were alſo made by Mr Æpinus. He poured melted ſulphur into metal cups; and obſerved, that, when the ſulphur was cold, the cup and ſulphur together ſhowed no ſigns of electricity, but very ſtrong ſigns of it the moment they were ſeparated. The electricity always diſappeared when the ſulphur was replaced in the cup, and revived upon its being taken out. The cup had acquired a negative, and the ſulphur a poſitive electricity; but if the electricity of either of them had been taken off while they were ſeparate, they would both, when united, ſhow ſigns of that electricity which had not been taken off.

Mr Wilcke alſo made ſeveral curious experiments concerning the effects of different rubbers upon electric ſubſtances, the moſt remarkable of which is the following: viz. that ſulphur rubbed againſt metals was always poſitive; and this was the only caſe in which it was ſo. But, being rubbed againſt lead, it became negative, and the metal poſitive.

With regard to the perpetual attractive power of ſulphur, &c. which Mr Grey fancied he had diſcovered *, the moſt remarkable example he gives is of a large cone of ſtone ſulphur, covered with a drinking glaſs in which it was made. This he ſaid would never fail to ſhow an attractive power when the glaſs was taken off. In fair weather, the glaſs would attract alſo; but not ſo ſtrongly as the ſulphur, which never failed to attract, let the wind or weather be ever ſo variable. This experiment has been repeated by Mr Henly; who ſays he has never known the ſulphur to fail of ſhowing ſigns of electricity on the removal of the glaſs. Gum-lac, roſin, &c. agree in the ſame general properties with ſulphur, but do not become ſo ſtrongly electrified ſpontaneouſly, nor are they ſo eaſily excited.

* See n

### § 4. *Phenomena of the Tourmalin.*

THESE have been accurately obſerved by Dr Prieſtley, who gives the following account of the methods he made uſe of for that purpoſe.

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1. To aſcertain the kind of electricity produced, he had always at hand a ſtand of baked wood with four arms projecting from it. Three of theſe were of glaſs, having threads of fine ſilk as it comes from the worm faſtened to them, and at the end of each thread a ſmall piece of down. From the other arm hung a fine thread about 9 or 10 inches long, while a braſs arm ſuſpended a pair of pith-balls. At the other extremity of this arm, which was pointed, a jar could be placed, to receive the electricity, and by the repulſive power of it keep the balls equally diverging with poſitive or negative electricity; or ſometimes he ſuſpended the balls in an uninſulated ſtate within the influence of large charged jars: and laſtly, he had always a fine thread of trial at hand, by which he could diſcover whether the ſtone was electrical or not before he began his experiments.

2. Before he began any experiments on the ſtone, alſo, he never failed to try how long the fine threads, which he uſed as electrometers, would retain their virtue; and found this to be various in various caſes. When the threads would retain their electric virtue for a few minutes, he preferred them; but when this was not the caſe, he had recourſe to the feathers, which never failed to retain it for ſeveral hours. They might be touched without any ſenſible loſs of power, though they received their virtue very ſlowly. In the experiments now to be related, he made uſe of Dr Heberden's large tourmalin, whoſe convex ſide became poſitive and the flat ſide negative in cooling; and in all of them, when the poſitive or negative ſide of the tourmalin is mentioned, it is to be underſtood that which is poſitive or negative in cooling.

3. From Mr Wilcke's experiments on the production of ſpontaneous electricity, by melting one ſubſtance within another, he firſt conjectured that the tourmalin might collect its electricity from the neighbouring air: To determine which the following experiment was made. Part of a pane of glaſs was laid on the ſtandard bar of an excellent pyrometer, and upon that glaſs the tourmalin was placed. This bar was

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heated by a ſpirit lamp, ſo that the increaſe or decreaſe of heat in the tourmalin could thus be exactly determined. In this ſituation he obſerved, that whenever he examined the tourmalin, the glaſs had acquired an electricity contrary to that ſide of the ſtone which lay upon it, and equally ſtrong with it. If, for example, the flat ſide of the ſtone had been preſented to a feather electrified poſitively, as the heat was increaſing, it would repel it at the diſtance of about two inches, and the glaſs would attract it at the ſame or a greater diſtance; and when the heat was decreaſing, the ſtone would attract, and the glaſs repel it at the diſtance of four or five inches. The caſe was the ſame whichever of the ſides was preſented, as well as when a ſhilling was faſtened with ſealing-wax upon the glaſs; the electricity both of the ſhilling and glaſs being always oppoſite to that of the ſtone. When it came to the turn, the electricity was very quickly reverſed; ſo that in leſs than a minute the electricity would be contrary to what it was before. In ſome caſes, however, viz. where the convex ſurface of the tourmalin was laid upon the glaſs or ſhilling, both of theſe became poſitive as well as the ſtone. This he ſuppoſed to be owing to the ſtone touching the ſurface on which it lay only in a few points, and that its electricity was collected from the air; which ſuppoſition was verified: for, getting a mould of Paris plaſter made for the tourmalin, and heating it in the mould, faſtened to a ſlip of glaſs, he always found the mould and glaſs poſſeſſed of an electricity contrary to that of the ſtone, and equally ſtrong with it. During the time of cooling, the mould ſeemed to be ſometimes more ſtrongly negative than the ſtone was poſitive; for once, when the ſtone repelled the thread at the diſtance of three inches, the mold attracted it at the diſtance of near ſix (A).

4 On ſubſtituting another tourmalin inſtead of the piece of glaſs; it was obſerved, that when one of the tourmalins was heated, both of them were electrified as much as the tourmalin and glaſs had been. If the negative ſide of a hot tourmalin was laid upon the negative ſide of a cold one, the latter became poſitive, as would have been the caſe with a piece of glaſs. On heating both the tourmalins, though faſtened together by cement, they acquired the ſame power that they would have done in the open air.

5. As the tourmalins could not in this caſe touch in a ſufficient number of points, it was now thought proper to vary the experiment by cooling the tourmalin in contact with ſealing-wax, which would fit it with the utmoſt exactneſs. On turning the ſtone, when cold, out of its waxen cell, it was found poſitive, and the wax negative; the electricity of the ſtone being thus contrary to what would have happened in the open air. The other ſide, which was not in contact with the wax, acquired the ſame electricity that it would have done though the ſtone had been heated in the open air; ſo that both ſides now became poſitive. In like manner the poſitive ſide of the ſtone, on being cooled in wax, became negative.

6. On attempting to aſcertain the ſtate of the different ſides of the tourmalin during the time it was heating in wax, many difficulties occurred. It was found impoſſible in theſe caſes to know exactly when the ſtone begins to cool; beſides, that in this method of treatment it muſt neceſſarily be ſome time in the open air before it can be preſented to the electrometer; and the electricity of the ſides in heating is by no means ſo remarkable as in cooling. In the experiments made with the tourmalin, when its poſitive ſide was buried in wax, it was generally found negative, though once or twice it ſeemed to be poſitive. On cooling it in quickſilver contained in a china cup, it always came out poſitive, and left the quickſilver negative; but this effect could not be concluded to be the conſequence of applying the one to the other, becauſe it is almoſt impoſſible to touch quickſilver without ſome degree of friction, which never fails to make both ſides ſtrongly poſitive though it be quite cold, and eſpecially if the ſtone be dipped deep into it. At laſt, ſuppoſing that the ſtone would not be apt to receive any friction by ſimple preſſure againſt the palm of the hand, he was induced to make the experiment, and found it fully to anſwer his expectations; for thus, each ſide of the ſtone was affected in a manner directly contrary to what would have happened in the open air.

Phenomena.

7. Faſtening the convex ſide of the large tourmalin to the end of a ſtick of ſealing-wax, and preſſing it againſt the palm of the hand, it acquired a ſtrong negative electricity, contrary to what would have happened in the open air. Thus it continued till it had acquired all the power it could receive by means of the heat of the hand; after which it began to decreaſe, though it continued ſenſibly negative to the very laſt. On allowing the ſtone to cool in the open air, its negative power conſtantly increaſed till it became quite cold.

8. On heating the ſame flat ſide by means of a hot poker held near it, and then juſt touching it with the palm of the hand when ſo hot that it could not be borne for any length of time, it became poſitive. Letting it cool in the air it became negative, and on touching it again with the hand it became poſitive; and thus it might be made alternately poſitive and negative for a conſiderable time. At laſt, when it became ſo cool that the hand could bear it, it acquired a ſtrong poſitive electricity, which continued till it came to the ſame degree of heat.

9. The wax was removed from the convex, and faſtened to the flat ſide of the ſtone; in which circumſtances it became weakly poſitive after receiving all the heat the hand could give it. On letting it cool in the open air it grew more ſtrongly poſitive, and continued ſo till it was quite cold; and thus the ſame ſide became poſitive both with heating and cooling.

10. On heating the convex ſide by means of a poker, and preſſing it againſt the palm of the hand as ſoon as it could be borne, it became pretty ſtrongly negative; though it is extremely difficult to procure any appearance

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(A) This would probably have been found always the caſe; for here the ſtone and mould acted in a manner ſimilar to the electrophorus and its metal plate; the latter of which always diſcovers a greater electric power than the former.

ance of negative electricity from this ſide; and care muſt be taken that a ſlight attraction of the electrified feather, by a body not electrified, be not miſtaken for negative electricity.

11. On covering the tourmalin when hot with oil and tallow, no new appearances were produced; nor did the heating of it in boiling oil produce any other effect than leſſening the electricity a little; and the event was the ſame when the tourmalin was covered with cement made of bees-wax and turpentine. On making a ſmall tourmalin very hot, and dropping melted ſealing-wax upon it, ſo as to cover it all over to the thickneſs of a crown piece, it was found to act through this coating nearly, if not quite, as well as if it had been expoſed to the open air. Thus a pretty deception may be made; for if a tourmalin be incloſed in a ſtick of wax, the latter will ſeem to have acquired the properties of the ſtone.

12. On letting the ſtone cool in the vacuum of an air-pump, its virtue ſeemed to be diminiſhed about one half, owing no doubt to the vacuum not being ſufficiently perfect.

13. On fixing a thin piece of glaſs oppoſite and parallel to the flat ſide of the tourmalin, and about a quarter of an inch diſtance from it, in an exhauſted receiver, the glaſs was ſo ſlightly electrified, that it could not be diſtinguiſhed whether it was poſitive or negative.

13. On laying the ſtone upon the ſtandard bar of the pyrometer, and communicating the heat to it by means of a ſpirit lamp, it was extremely difficult to determine the nature of the electricity while the heat was increaſing to 70°; during which time the index of the pyrometer moved about one 7200th part of an inch. But if the ſtone was taken off the bar, and an electrified thread or feather preſented to that ſide which had lain next it, the convex ſide was always negative, and the flat one poſitive.

14. To determine what would be the effect of keeping the tourmalin in the very ſame degree of heat for a conſiderable time together, it was laid upon the middle of the bar, to which heat was communicated by two ſpirit lamps, one at each extremity; and making the index move 45 degrees, it was kept in the ſame degree for half an hour without the leaſt ſenſible variation; and it was obſerved, that the upper ſide, which happened to be the convex one, was always electrified in a ſmall degree, attracting a fine thread at the diſtance of about a quarter of an inch. If in that time it was taken off the bar, though ever ſo quick, and an electrified feather preſented to it, the flat ſide, which lay upon the bar, was negative, and the upper ſide very ſlightly poſitive, which appeared only by its not attracting the feather. On putting a piece of glaſs between the ſtone and ſtandard bar, keeping it likewiſe in the ſame degree of heat, and for the ſame ſpace of time as before, the reſult was the ſame; the glaſs was ſlightly electrified, and of a kind oppoſite to that of the ſtone itſelf. To avoid the inconvenience of making one ſide of the ſtone hotter than another, which neceſſarily took place when it was heated on the pyrometer, the following method was uſed. By means of two rough places which happened to be in the ſtone, it was tied with a ſilk thread which touched only the extreme edge of it; and thus being perfectly inſulated, it might be held at any diſtance from a candle, and heated to what degree was thought neceſſary; while, by twiſting the ſtring, it was made to preſent its ſides alternately, and thus the heat was rendered very equal in both. After being made in this manner ſo hot that the hand could ſcarce bear it, it was kept in that ſituation for a quarter of an hour. Then, with a bundle of fine thread held for ſome time before in the ſame heat, the electricity which it had acquired by heating was taken off, and it was found to acquire very little if any; whence appeared the juſtneſs of an obſervation of Mr Canton's, that it is the change of heat, and not the degree of it, that produces the electric property of this ſtone.

15. On heating the ſtone ſuddenly, it may ſometimes be handled and preſſed with the fingers ſeveral times before any change takes place in the electricity which it acquires by heating, though it begins to cool the moment it is removed from the fire. In this caſe, however, the ſtone muſt be heated only to a ſmall degree. When the heat is three or four times as great as is ſufficient to change the electricity of the two ſides, the virtue of the ſtone is the ſtrongeſt, and appears to be ſo when it is tried in the very neighbourhood of the fire. In the very centre of the fire the ſtone never fails to cover itſelf with aſhes attracted to it from every quarter; whence it acquired its name in Dutch.

16. The tourmalin often changes its electricity very ſlowly; and that which it acquires in cooling never fails to remain many hours upon it with very little diminution. It is even poſſible, that in ſome caſes the electricity acquired by heating may be ſo ſtrong as to overpower that which is acquired by cooling; ſo that both ſides may ſhow the ſame power in the whole operation. "I am very certain (ſays the Doctor), that in my hands both the ſides of Dr Heberden's large tourmalin have frequently been poſitive for ſeveral hours together, without any appearance of either of them having been negative at all. At this time I generally heated the tourmalin, by preſenting each ſide alternately to a red hot poker, or a piece of hot glaſs, held at the diſtance of about half an inch, and ſometimes I held it in the focus of a burning mirror; but I have ſince found the ſame appearance when I heated it in the middle of an iron hoop made red hot. The ſtone in all theſe caſes was faſtened by its edge to a ſtick of ſealing-wax. This appearance I have obſerved to happen the ofteneſt when the iron hoop has been exceedingly hot, ſo that the outſide of the ſtone muſt have been heated ſome time before the inſide; and I alſo think there is the greateſt chance of producing this appearance, when the convex ſide of the ſtone is made the hotter of the two. When I heat the large tourmalin in this manner, I ſeldom fail to make both ſides of the ſtone poſitive till it be about blood-warm. I then generally obſerve a ragged part of the flat ſide towards one end of the ſtone become negative firſt, and by degrees the reſt of the flat ſide; but very often one part of the flat ſide will, in this method of treatment, be ſtrongly poſitive half an hour after the other part is become negative."

### SECT. V. *Of the different Theories of Electricity, with the principal Experiments brought in favour of each, and which tend more particularly to ſhow the Nature of the Electric Fluid.*

IT is not to be ſuppoſed, that the phenomena of electricity would long be obſerved without attempts to account for them. In fact, this was attempted by Thales, who firſt obſerved the attractive power of amber. At this property he was ſo much ſurpriſed, that he reckoned the amber to be *animated*. With regard to the ſentiments of Theophraſtus on this ſubject, we are entirely in the dark; but, among the ſucceeding electricians, all the phenomena were derived from *unctuous effluvia* emitted by the excited electric. Theſe were ſuppoſed to faſten upon all bodies in their way, and to carry back with them all that were not too heavy. For, at that time, effluvia of every kind were ſuppoſed to return to the bodies from which they were emitted; ſince nobody could otherwiſe account for the ſubſtance not being ſenſibly waſted by the conſtant emiſſion. When theſe light bodies on which the unctuous effluvia had faſtened were arrived at the excited electric, a freſh emiſſion of the effluvia was ſuppoſed to carry them back again. But this effect of the effluvia was not thought of till electric repulſion, as well as attraction, had been fully obſerved.

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The diſcovery of a difference between conducting and non-conducting ſubſtances, threw conſiderable difficulties in the way of thoſe who maintained the hypotheſis of unctuous effluvia. When the Newtonian philoſophy began to be pretty generally received, the terms *attraction* and *repulſion* were quickly introduced into electricity, as well as other branches of philoſophy; and the electric effluvia, inſtead of being of an *unctuous* nature, were ſaid to be of an attractive or repulſive one. At the ſame time, the apparent ſtop which is put to the progreſs of theſe effluvia by any electric ſubſtance, introduced a queſtion not yet well decided, viz. Whether electric bodies are penetrable by the fluid or not?

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When Mr Du Fay diſcovered the two oppoſite ſpecies of electricity, at that time diſtinguiſhed by the names of *vitreous* and *reſinous*, and afterwards by thoſe of *plus* and *minus*, or poſitive and negative, he formed the idea of two diſtinct electric fluids. Both theſe were ſuppoſed to have a *repulſive* power with reſpect to themſelves, but an *attractive* one with regard to one another.

As long as electrical attraction and repulſion were the only phenomena to be accounted for, this theory ſerved the purpoſe well enough. To account for attraction and repulſion by an *attractive* and *repulſive* power, was indeed no explication at all; but it afforded a change of terms, which is too frequently miſtaken for an explanation both in electricity and other parts of philoſophy.—At laſt, however, Mr Du Fay dropped his opinion concerning the exiſtence of two electric fluids, and thought that all the phenomena might be accounted for from the action of a ſingle one. The vitreous or poſitive electricity, which was ſuppoſed to be the ſtronger, he thought might attract the negative, or weaker electricity.—It is indeed true, that, in many experiments, the poſitive electricity doth manifeſt a ſuperiority in ſtrength over the negative, ſomething like that ſuperior degree of vigour which is obſerved in one of the poles of a loadſtone over the other. According to Mr Du Fay's own principles, however, had this been the caſe, a body poſitively electrified ought to have attracted one electrified negatively more weakly than one not electrified at all; which is contrary to experience.

57
Electric matter diſcovered to come from the earth.

During all this time, it was imagined, that the electric matter, whether it conſiſted of one or more fluids, was produced from the electric body by friction; but by a diſcovery of Dr Watſon's, it became univerſally believed, that the glaſs globes and tubes ſerved only to ſet the fluid in motion, but by no means to produce it. He was led to this diſcovery by obſerving, that, upon rubbing the glaſs tube, while he was ſtanding upon cakes of wax or roſin (in order, as he expected, to prevent any diſcharge of the electric matter upon the floor), the power was, contrary to his expectation, ſo much leſſened, that no ſnapping could be obſerved upon another perſon's touching any part of his body; but that, if a perſon not electrified held his hand near the tube while it was rubbed, the ſnapping was very ſenſible. The event was the ſame when the globe was whirled in ſimilar circumſtances. For, if the man who turned the wheel, and who, together with the machine, was ſuſpended upon ſilk, touched the floor with one foot, the electric fire appeared upon the conductor; but if he kept himſelf free from any communication with the floor, little or no fire was produced.—He obſerved, that only a ſpark or two would appear between his hand and the inſulated machine, unleſs he at the ſame time formed a communication between the conductor and the floor; but that then there was a conſtant and copious flux of the electric matter obſerved between them. From theſe, and ſome other experiments of a ſimilar kind, the Doctor diſcovered what he called the *complete circulation* of the electric matter. When he found, that, by cutting off the communication of the glaſs globe with the floor, all electric operations were ſtopped, he concluded, that the electric fluid was conveyed from the floor to the rubber, and from thence to the globe. For the ſame reaſon, ſeeing the rubber, or the man who had a communication with it, gave no ſparks but when the conductor was connected with the floor, he as naturally concluded, that the globe was ſupplied from the conductor, as he had before concluded that it was ſupplied from the rubber. From all this he was at laſt led to form a new theory of electricity, namely, that, in electric operations, there was both an *afflux* of electric matter to the globe and the conductor, and likewiſe an *efflux* of the ſame electric matter from them. Finding that a piece of leaf-ſilver was ſuſpended between a plate electrified by the conductor, and another communicating with the floor, he reaſons from it in the following manner. "No body can be ſuſpended in equilibrio but by the joint action of two different directions of power: ſo here the blaſt of electric ether from the floor ſetting through it, drives the ſilver towards the plate electrified. We find from hence, likewiſe, that the draught of electric ether from the floor is always in proportion to the quantity thrown by the globe over the gun-barrel (the prime conductor at that time made uſe of), or the equilibrium by which the ſilver is ſuſpended could not be maintained." Some time after, however, the Doctor retracted this opinion concerning the afflux and efflux, and ſuppoſed that all the electric phenomena might be accounted for from the exceſs or diminution of the quantity of electric matter

58
Dr Watſon's theory of afflux and efflux.

contained in different bodies. This theory was afterwards adopted by Dr Franklin, and continues to be generally received.

59
Difficulty concerning the direction of the electric fluid.

One great difficulty with which the firſt electricians were embarraſſed (and which is yet ſcarcely removed), was to aſcertain the direction of the fluid. At firſt, all electric powers, as we have already obſerved, were ſuppoſed to reſide in the excited globe or glaſs tube. The electric ſpark therefore was imagined to proceed from the electrified body towards any conductor that was preſented towards it. It was never imagined there could be any difference in this reſpect, whether it was amber, glaſs, ſealing-wax, or any thing elſe that was excited. This progreſs of the electric matter was thought to be quite evident to the ſenſes; and therefore the obſervation of electric appearances at an inſulated rubber occaſioned the greateſt aſtoniſhment.—In this caſe, the current could not be ſuppoſed to flow both from the rubber and the conductor, and yet the firſt appearances were the ſame. To provide a ſupply of the electric matter, therefore, philoſophers were obliged to ſuppoſe, that, notwithſtanding appearances were in both caſes much the ſame, the electric fluid was really emitted in one caſe by the electrified body, and received by it in the other. But now being obliged to give up the evidence from ſight for the manner of its progreſs, they were at a loſs, whether, in the uſual method of electrifying by excited glaſs, the fluid proceeded from the rubber to the conductor, or from the conductor to the rubber. It was, however, ſoon found, that the electricity at the rubber was the reverſe of that at the conductor, and in all reſpects the ſame with that which had before been produced by the friction of ſealing-wax, ſulphur, roſin, &c. Seeing, therefore, that both the electricities were produced at the ſame time, by one and the ſame electric, and by the ſame friction, all philoſophers were naturally led to conclude, that both were modifications of one fluid; though in what manner that fluid was modified throughout the immenſe variety of electric phenomena, was a matter not eaſy to be determined.

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Abbe Nollet's theory.

On this ſubject, the Abbe Nollet adopted the doctrine of *afflux* and *efflux* already mentioned. He ſuppoſed, that, in all electrical operations, the fluid is thrown into two oppoſite motions; that the afflux of this matter drives all light bodies before it by impulſe upon the electrified body, and its efflux carries them back again. He was, however, very much embarraſſed in accounting for facts where both theſe currents muſt be conſidered; as in the quick alternate attraction and repulſion of light bodies by an excited glaſs tube, or other excited electric. To obviate this difficulty, he ſuppoſes that every excited electric, and likewiſe every body to which electricity is communicated, has two orders of pores, one for the emiſſion of the effluvia, and another for the reception of them. Mr de Tour improved upon Nollet's hypotheſis, and ſuppoſed that there is a difference between the affluent and effluent current; and that the particles of the fluid are thrown into vibrations of different qualities, which makes one of theſe currents more copious than the other, according as ſulphur or glaſs is uſed. It is impoſſible, however, that ſuppoſitions ſo very arbitrary could be at all ſatisfactory, or received as proper ſolutions of the electric phenomena.

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No leſs difficult was it for philoſophers to determine the nature of the electric fluid, than its manner of acting. It had been in a manner generally believed, that *fire* was not a diſtinct element, but aroſe from ſome violent repulſions, rarefactions, &c. among the particles of ignited bodies. The great reſemblance of the electric fluid to elementary fire, however, ſeemed ſtrongly to militate againſt this opinion. The hypotheſis therefore of fire as a diſtinct principle or element began to revive. Some maintained, that the electric fluid was really this principle; others thought that it was a fluid *ſui generis*, very much reſembling that of fire; while others, with Mr Boulanger at their head, imagined that it was nothing more than the finer parts of the atmoſphere, which crowded upon the ſurfaces of electric bodies, when the groſſer parts had been driven away by the friction of the rubber.

This laſt opinion, however, ſoon received a full refutation from the experiments of Dr Watſon above-mentioned; by which it was proved, that the electric matter came not from the atmoſphere, but from the earth. About the ſame time the Leyden phial was diſcovered; and the extraordinary effects of it rendered the inquiries into the nature of the electric fluid much more general than before. But ſtill, the violent prejudice againſt the exiſtence of fire as a real element or fluid diſtinct from terreſtrial bodies, continued in its full vigour, and the moſt extravagant theories were acquieſced in, rather than the ſimple poſition above mentioned. It would be tedious, and indeed impoſſible, to give an account of all the theories which were now invented. One of the moſt remarkable, and moſt conſiſtent, was that of Mr Wilſon. According to this gentleman, the chief agent in all the operations of electricity, is Sir Iſaac Newton's ether; which is more or leſs denſe in all bodies in proportion to the ſmallneſs of their pores, except that it is much denſer in ſulphureous and unctuous bodies. To this ether are aſcribed the principal phenomena of attraction and repulſion: the light, the ſulphureous or rather phoſphoreal ſmell with which violent electricity is always attended, and other ſenſible qualities, are aſcribed to the groſſer particles of bodies driven from them by the forcible action of this ether. He alſo endeavours to explain many electrical phenomena by means of a ſubtle medium at the ſurface of all bodies; which is the cauſe of the refraction and reflection of the rays of light, and alſo reſiſts the entrance and exit of this ether. This medium, he ſays, extends to a ſmall diſtance from the body, and is of the ſame nature with what is called the *electric fluid*. On the ſurface of conductors this medium is rare, and eaſily admits the paſſage of the electric fluid; whereas, on the ſurface of electrics, it is denſe and reſiſts it. The ſame medium is rarefied by heat, which thus changes conductors into non-conductors. By far the greater number of philoſophers, however, rejected the opinion of Mr Wilſon; and as they neither choſe to allow the electric fluid to be *fire* nor *ether*, they were obliged to own that it was a fluid *ſui generis*, i. e. one of whoſe nature they were totally ignorant.

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Mr W ſon's th ry.

But while philoſophers were thus embarraſſed in their electrical theories, a vaſt number of intereſting phenomena were diſcovered by the aſſiduity of a number of different electricians in different countries. Mr Winckler obſerved, that if glaſs was rubbed on the inſide,

ſide, it would ſhow ſtrong appearances of electricity on the outſide; which ſeemed to favour the opinion of the permeability of glaſs to the electric matter. Other German electricians uſed ſeveral globes at a time, and imagined they found effects proportionable; tho' this has ſince been found a miſtake. Such a prodigious force, however, could they excite by means of theſe globes whirled by a large wheel, and rubbed by the hand or with woollen cloth, that, according to their own accounts, blood could be drawn from a finger by means of the electric ſpark, the ſkin would burſt, and a wound appear as if made by a cauſtic. If ſeveral globes or tubes were uſed, they ſaid, that the motion of the heart and arteries would be very perceptibly increaſed in ſuch as were electrified; and that, if a vein was opened in theſe circumſtances, the blood iſſuing from it would appear like lucid phoſphorus, and run out faſter than when the perſon was not electrified. Mr P. Gordon, a Scots Benedictine monk, and profeſſor of philoſophy at Erfurd, increaſed the electric ſparks to ſuch a degree, that they were felt from a man's head to his foot, ſo that he could hardly take them without falling down with giddineſs, and ſmall birds were killed by them. This was effected by conveying the electricity with iron wires to the diſtance of 200 ells from the place of excitation. He alſo found that the ſparks were ſtronger when the wires were thick than when they were ſmall.

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While the power of electricity was thus tried, another queſtion of great importance was likewiſe decided, namely, Whether electricity acted according to the largeneſs of the ſurface of bodies? This was found to be in proportion to the ſurface, and not the ſolid contents. The magnetic effluvia alſo were found not to interfere in the leaſt with the electrical ones. An electrified loadſtone attracted light bodies of all kinds by its electric virtue, at the ſame time that it attracted iron and ſteel by its peculiar magnetic virtue. The attractive virtue of electricity was alſo found to pervade glaſs ſo powerfully, that a thread was attracted through five exhauſted receivers, and ſeemingly with more vigour than it would have been by the excited tube alone in the open air.

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Such was the ſtate of philoſophical opinions concerning electricity, when Dr Franklin firſt invented his theory concerning poſitive and negative, or *plus* and *minus*, electricity. This had been already ſuggeſted by Dr Watſon, but was not ſo fully explained by him as by Dr Franklin; on which account the latter is generally reckoned to be the ſole inventor. According to this theory, all the operations in electricity depend upon one fluid *ſui generis*, extremely ſubtile and elaſtic. Between the particles of this fluid there ſubſiſts a very ſtrong repulſion with regard to each other, and as ſtrong an attraction with regard to other matter. Thus, according to Dr Franklin's hypotheſis, one quantity of electric matter will repel another quantity of the ſame, but will attract and be attracted by any terreſtrial matter that happens to be near it. The pores of all bodies are ſuppoſed to be full of this ſubtile fluid; and when its equilibrium is not diſturbed, that is, when there is in any body neither more nor leſs than its natural ſhare, or than that quantity which it is capable of retaining by its own attraction, the fluid does not manifeſt itſelf to our ſenſes. The action of the rubber upon an electric diſturbs this equilibrium, occaſioning a deficiency of the fluid in one place, and a redundancy of it in another. This equilibrium being forcibly diſturbed, the mutual repulſion of the particles of the fluid is neceſſarily exerted to reſtore it. If two bodies be both of them overcharged, the electric atmoſpheres repel each other, and both the bodies recede from one another to places where the fluid is leſs denſe. For as there is ſuppoſed to be a mutual attraction between all bodies and the electric fluid, ſuch bodies as are electrified muſt go along with their atmoſpheres. If both the bodies are exhauſted of their natural ſhare of this fluid, they are both attracted by the denſer fluid exiſting either in the atmoſphere contiguous to them, or in other neighbouring bodies; which occaſions them ſtill to recede from one another as if they were overcharged.

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Difficulty concerning the reaſon why bodies negatively electrified repel one another.

This is the Franklinian doctrine concerning the cauſe of electric attraction and repulſion; but it is evident, that the reaſon juſt now given why bodies negatively attracted ought to repel one another, is by no means ſatisfactory. Dr Franklin himſelf had framed his hypotheſis before he knew that bodies negatively electrified would repel one another; and when he came afterwards to learn it, he was ſurpriſed, and acknowledged that he could not ſatisfactorily account for it *. Other philoſophers therefore invented different ſolutions of this difficulty, of which that above mentioned is one. But by ſome this was rejected. They ſaid, that as the denſer electric fluid, ſurrounding two bodies negatively electrified, acts equally on all ſides of thoſe bodies, it cannot occaſion their repulſion. The repulſion, according to them, is owing rather to an accumulation of the electric on the ſurfaces of the two bodies; which accumulation is produced by the attraction, and the difficulty the fluid finds in entering them. This difficulty is ſuppoſed chiefly to be owing to the air on the ſurface of bodies, which Dr Prieſtley ſays is probably a little condenſed there. This he deduces from an experiment of Mr Wilſon, corrected by Mr Canton. The experiment was made in order to obſerve the courſe of the electric light through a Torricellian vacuum. A ſingular appearance of light was obſerved upon the ſurface of the quickſilver, at which the fluid was ſuppoſed to enter. Mr Wilſon ſuppoſed that this was owing to a ſubtile medium ſpread over the ſurface of the quickſilver, and which prevented the eaſy entrance of the electric fluid. But this was afterwards diſcovered by Mr Canton to be owing to a ſmall quantity of air which had been left in the tube. It is plain, however, that as the attraction is equal all round, and likewiſe the difficulty with which the fluid penetrates the air, bodies negatively electrified ought not to repel one another on this ſuppoſition more than the former. Nay, they ought to attract each other; becauſe, in the place of contact, the reſiſtance of the air would be taken off, and the electric fluid could come from all other quarters by the attraction of the bodies.

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Different ſolutions of this difficulty.

68
Mr Cavallo's ſolution.

Mr Cavallo, who ſeems to have undertaken the defence of this hypotheſis in all caſes, gives another reaſon why bodies negatively electrified ſhould repel each other. In a chapter intitled, "A Compendious View of the principal properties of Electricity," among others he gives the following: "No electricity can be ob-

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* *Franklin's Letters.*

obſerved upon the ſurface of any electrified body, except that ſurface is contiguous to an electric, which electric can ſome how or other acquire a contrary electricity at a little diſtance. Otherwiſe:—No electricity can appear upon the ſurface of any electrified body, except that ſurface is oppoſite to another body which has actually acquired the contrary electricity, and theſe contrarily electrified bodies are ſeparated by an electric. On conſidering this principle (adds he), it may be aſked, Why an electricity can be obſerved upon the ſurface of an electrified body that is inſulated at a conſiderable diſtance from other conductors? Or, Which is the electric that is contiguous to the ſurface of an electrified conductor or excited electric, and which has actually acquired a contrary electricity at a little diſtance from the ſaid ſurface? To this queſtion it is anſwered, that the air is, in general, the electric which is oppoſite to the ſurface of any electrified body; which, not being a perfect conductor, does eaſily acquire a contrary electricity on a ſtratum of its ſubſtance that is at a little diſtance from the electrified body; and, in conſequence of this ſtratum, it acquires another ſtratum contrarily electrified, and at a little diſtance from the former: to this other ſtrata ſucceed, alternately poſſeſſed of poſitive and negative electricities, and decreaſing in power till they vaniſh. This aſſertion is eaſily proved by ſeveral experiments, particularly the following. If the end of a pretty long glaſs tube be preſented to a body electrified, for inſtance, poſitively, the tube will be found electrified poſitively alſo for the ſpace of one or two inches at that end; but beyond that ſpace, will be found two or three inches electrified negatively: after that another poſitive electricity will appear; and ſo alternately, a poſitive and a negative zone will follow one another, always weaker and weaker in power, till at laſt they quite vaniſh. This ſhows, that, in general, when an electric ſufficiently denſe is preſented to an electrified body, it acquires ſucceſſive zones or ſtrata of poſitive and negative electricity."

From this fact (which, with the utmoſt impropriety, he terms a *law* of electricity, whereas it is moſt evidently the *effect* of a law, and not the law itſelf), Mr Cavallo gives the following reaſon why bodies negatively electrified repel one another. "As to the repulſion exiſting between bodies poſſeſſed of the ſame electricity; in order to underſtand its explanation thoroughly, the reader muſt be reminded of the principle above-mentioned, which is, that no electricity, *i. e.* the electric fluid proper to a body, can either be augmented or diminiſhed upon the ſurface of that body, except the ſaid ſurface is contiguous to an electric, which can acquire a contrary electricity at a little diſtance: from whence it follows, that no electricity can be diſplayed upon the facing ſurfaces of two bodies that are ſufficiently near to one another, and both poſſeſſed of the ſame electricity; for the air that lies between thoſe contiguous ſurfaces has no liberty of acquiring any contrary electricity. This being premiſed, the explanation of electric repulſion becomes very eaſy. Suppoſe, for inſtance, that two ſmall bodies are freely ſuſpended by inſulated threads; ſo that, when they are not electrified, they may hang contiguous to one another. Now ſuppoſe theſe bodies to be electrified either poſitively or negatively, and then they muſt repel one another: for either the increaſed or the diminiſhed natural quantity of electric fluid in theſe bodies will endeavour to diffuſive itſelf equally over every part of the ſurfaces of theſe bodies; and this endeavour will cauſe the ſaid bodies to recede from each other, ſo that a quantity of air may be interpoſed between their ſurfaces, ſufficient to acquire a contrary electricity at a little diſtance from the ſaid ſurfaces. Otherwiſe: If the bodies poſſeſſed of the ſame electricity do not repel each other, ſo that a ſufficient quantity of air may be interpoſed between their ſurfaces, the increaſed quantity of electric fluid when the bodies are electrified poſitively, or the remnant of it when they are electrified negatively, by the above principle cannot be diffuſed equally throughout or over the ſurfaces of theſe bodies; for no electricity can appear upon the ſurfaces of bodies in contact, or that are very near each other. But the electric fluid, by attracting the particles of matter, endeavours to diffuſe itſelf equally throughout or over the ſurfaces of theſe bodies; therefore the ſaid bodies are, by this endeavour, forced to repel one another."

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This theory is evidently no ſolution of the difficulty; ſeeing it is only explaining one fact by another, which requires explanation at leaſt as much as the firſt. But though this ſhould be overlooked, it is ſtill inſufficient; for, granting that bodies negatively electrified ought to repel one another till the electricity is equally diffuſed along their ſurfaces, yet when this is accompliſhed, the repulſion ought to ceaſe. Now, there is no occaſion for ſuppoſing the bodies to be electrified while they are in contact, or nearly ſo. One may be electrified negatively in one corner of a room, and another in the other. The electrification may alſo be continued for any length of time we pleaſe, ſo that it is not poſſible to ſuppoſe but the electric matter muſt have diffuſed itſelf equally along the ſurfaces of both: yet, if we attempt to bring theſe bodies together, we ſhall find that they will repel each other very violently; which ought not to be the caſe, according to Mr Cavallo's ſuppoſition.

70 Dr Franklin's explanation of the phenomena of the Leyden phial.

What gave the greateſt reputation to Dr Franklin's theory, however, is the eaſy ſolution which it affords of all the phenomena of the Leyden phial. The fluid is ſuppoſed to move with the greateſt eaſe in bodies which are conductors, but with extreme difficulty in *electrics per ſe*; inſomuch that glaſs is abſolutely impermeable to it. It is moreover ſuppoſed, that all electrics, and particularly glaſs, on account of the ſmallneſs of their pores, do at all times contain an exceeding great, and always an equal quantity of this fluid; ſo that no more can be thrown into any one part of any electric ſubſtance, except the ſame quantity go out at another, and the gain be exactly equal to the loſs. Theſe things being previouſly ſuppoſed, the phenomena of charging and diſcharging a plate of glaſs admit of an eaſy ſolution. In the uſual manner of electrifying by a ſmooth glaſs globe, all the electric matter is ſupplied by the rubber from all the bodies which communicate with it. If it be made to communicate with nothing but one of the coatings of a plate of glaſs, while the conductor communicates with the other, that ſide of the glaſs which communicates with the rubber muſt neceſſarily be exhauſted in order to ſupply the conductor, which muſt convey the whole of it to the ſide with which it communicates. By this operation, therefore, the electric fluid becomes almoſt entirely exhauſted on one ſide of the plate, while it is as much accumulated on the other; and the diſcharge is made by the electric fluid ruſhing, as ſoon as an opportunity is given it by means of proper conductors, from the ſide which was overloaded to that which is exhauſted.

It is not, however, neceſſary to this theory, that the very ſame individual particles of electric matter which were thrown upon one ſide of the plate, ſhould make the whole circuit of the intervening conductors, eſpecially in very great diſtances, ſo as actually to arrive at the exhauſted ſide. It may be ſufficient to ſuppoſe, that the additional quantity of fluid diſplaces and occupies the ſpace of an equal portion of the natural quantity of fluid belonging to thoſe conductors in the circuit which lay contiguous to the charged ſide of the glaſs. This diſplaced fluid may drive forwards an equal quantity of the ſame matter in the next conductor; and thus the progreſs may continue till the exhauſted ſide of the glaſs is ſupplied by the fluid naturally exiſting in the conductors contiguous to it. In this caſe, the motion of the electric fluid, in an exploſion, will rather reſemble the vibration of the air in ſounds, than a current of it in winds.

It will ſoon be acknowledged (ſays Dr Prieſtley), that while the ſubſtance of the glaſs is ſuppoſed to contain as much as it can poſſibly hold of the electric fluid, no part of it can be forced into one of the ſides, without obliging an equal quantity to quit the other ſide: but it may be thought a difficulty upon this hypotheſis, that one of the ſides of a glaſs plate cannot be exhauſted, without the other receiving more than its natural ſhare; particularly, as the particles of this fluid are ſuppoſed to be repulſive of one another. But it muſt be conſidered, that the attraction of the glaſs is ſufficient to retain even the large quantity of electric fluid which is natural to it, againſt all attempts to withdraw it, unleſs that eager attraction can be ſatisfied by the admiſſion of an equal quantity from ſome other quarter. When this opportunity of a ſupply is given, by connecting one of the coatings with the rubber, and the other with the conductor, the two attempts to introduce more of the fluids into one of the ſides are made, in a manner, at the ſame inſtant. The action of the rubber tends to diſturb the equilibrium of the fluid in the glaſs; and no ſooner has a ſpark quitted one of the ſides, to go to the rubber, than it is ſupplied by the conductor on the other; and the difficulty with which theſe additional particles move in the ſubſtance of the glaſs, effectually prevents its reaching the oppoſite exhauſted ſide. It is not ſaid, however, but that either ſide of the glaſs may give or receive a ſmall quantity of the electric fluid, without altering the quantity on the oppoſite ſide. It is only a very conſiderable part of the charge that is meant, when one ſide is ſaid to be filled while the other is exhauſted.

It is a little remarkable, adds Dr Prieſtley, that the electric fluid, in this and in every other hypotheſis, ſhould ſo much reſemble the ether of Sir Iſaac Newton in ſome reſpects, and yet differ from it ſo eſſentially in others. The electric fluid is ſuppoſed to be, like ether, extremely ſubtile and elaſtic, that is, repulſive of itſelf; but inſtead of being, like the ether, repelled by all other matter, it is ſtrongly attracted by it: ſo that, far from being, like the ether, rarer in the ſmall than in the large pores of bodies, rarer within the bodies than at their ſurfaces, and rarer at their ſurfaces than at any diſtance from them; it muſt be denſer in ſmall than in large pores, denſer within the ſubſtance of bodies than at their ſurfaces, and denſer at their ſurfaces than at a diſtance from them.

71
Attraction and repulſion thro' glaſs accounted for.

To account for the attraction of light bodies, and other electrical appearances, in air of the ſame denſity with the common atmoſphere, when glaſs (which is ſuppoſed to be impermeable to electricity) is interpoſed; it is conceived, that the addition or ſubtraction of the electric fluid, by the action of the excited electric on one ſide of the glaſs, occaſions, as in the experiment of the Leyden phial, a ſubtraction or addition of the fluid on the oppoſite ſide. The ſtate of the fluid, therefore, on the oppoſite ſide being altered, all light bodies within the ſphere of its action muſt be affected in the very ſame manner as if the effluvia of the excited electric had actually penetrated the glaſs, according to the opinions of all electricians before Dr Franklin.

This hypotheſis has been in ſome meaſure improved by Mr Æpinus, in a treatiſe intitled, "Tentamen Theoriæ Electricitatis & Magnetiſmi." He extends the property of impermeability to air, and all electrics, as well as glaſs. He ſuppoſes *impermeability* to conſiſt in the great difficulty with which electric ſubſtances admit the fluid into their pores, and the ſlowneſs with which it moves in them. In conſequence of this impermeability of air to the electric fluid, he denies the exiſtence of electric atmoſpheres, and thinks that Dr Franklin's theory will do much better without them. He alſo imagines, that all the particles of matter are repulſive of one another: for that otherwiſe (ſince all ſubſtances have in them a certain quantity of the electric fluid, the particles of which repel one another and are attracted by all other matter), it could not happen, that bodies in their natural ſtate with reſpect to electricity, ſhould neither attract nor repel one another. He alſo introduces a number of mathematical calculations; the reſult of which (ſays Dr Prieſtley, with a great deal of probability) cannot be depended upon.

72
Principles on which Dr Franklin's theory depends.

The above is a full explanation of the theory of electricity at preſent moſt generally received. It depends on the following principles. 1. All terreſtrial ſubſtances, as well as the atmoſphere which ſurrounds the earth, are full of electric matter. 2. Glaſs, and other electric ſubſtances, though they contain a great deal of electric matter, are nevertheleſs *impermeable* by it. 3. This electric matter violently repels itſelf, and attracts all other matter. 4. By the excitation of an electric, the equilibrium of the fluid contained in it is broken; and one part of it is overloaded with electricity, while the other contains too little. 5. Conducting ſubſtances are permeable to the electric matter through their whole ſubſtance, and do not conduct it merely over their ſurface. 6. Poſitive electricity is when a body has too much of the electric fluid, and negative electricity when it has too little. Of theſe poſitions we ſhall now adduce thoſe proofs drawn from

Theory. different facts, which ſeem in the ſtrongeſt manner to confirm them.

I. "All terreſtrial ſubſtances, as well as the atmoſphere which ſurrounds the earth, are filled with electric fluid."—Of this the proofs are very eaſy. There is no place of the earth or ſea, where the electric fire may not be collected by making a communication between it and the rubber of an electric machine. Therefore, conſidering that the whole earth is moiſt, that moiſture is a conductor of electricity, and that every part of the earth muſt thus communicate with another, it is certain that the electric matter muſt diffuſe itſelf as far as the moiſture of the earth reaches; and this we may reaſonably ſuppoſe to be to the very centre.

73 Proofs of atmoſpherical electricity.

With regard to the atmoſphere, the caſe is equally clear. We have formerly mentioned in general, that Dr Franklin, and others, had collected electricity from the atmoſphere in great quantity during the time of thunder-ſtorms; but it is now found that it may be collected from the air at any time. The beſt inſtrument for this purpoſe is the electrical kite. Mr Cavallo, who hath made a great many experiments in atmoſpherical electricity, obſerves that the whole power of this machine lies in the ſtring. A common ſchool-boy's kite anſwers the purpoſe as well as any other. The beſt method of making the ſtring is by twiſting two threads of common twine with one of that copper-thread which is uſed for trimmings. When a kite conſtructed in this manner was raiſed, he ſays, he always obſerved the ſtring to give ſigns of electricity, except once. The weather was warm, and the wind ſo weak, that the kite was raiſed with difficulty, and could hardly be kept up for a few minutes. Afterwards, however, when the wind increaſed, he obtained, as uſual, a pretty ſtrong poſitive electricity. Concerning the management of this kite he gives the following directions.

74 Mr Cavallo's directions concerning the electrical kite.

"In raiſing the kite, when the weather is very cloudy and rainy, in which time there is danger of meeting with a great quantity of electricity, I generally uſe to hang upon the ſtring *AB* (Plate CLXXVII. fig. 78.) the hook of a chain *C*, the other extremity of which falls on the ground. Sometimes I uſe another caution beſides, which is to ſtand upon an inſulating ſtool; in which ſituation, I think, that if any quantity of electricity, ſuddenly diſcharged by the clouds, ſtrikes the kite, it cannot much affect any perſon. As to inſulated reels, and other ſuch like inſtruments that ſome gentlemen have uſed to raiſe the kite without any danger of receiving a ſhock; fit for the purpoſe as they may appear in theory, they are yet very inconvenient to be managed. Except the kite be raiſed in the time of a thunder-ſtorm, there is no great danger for the operator to receive any ſhock. Although I have raiſed my electrical kite hundreds of times without any caution whatever, I have very ſeldom received a few exceedingly ſlight ſhocks in my arms. In time of a thunder-ſtorm, if the kite has not been raiſed before, I would not adviſe a perſon to raiſe it while the ſtormy clouds are juſt overhead; the danger at ſuch a time being very great, even with the precautions abovementioned: at that time the electricity of the clouds may be obſerved, without raiſing the kite, by a cork-ball electrometer held in the hand in an open place, or, if it rains, by the electrometer for rain, to be deſcribed hereafter.

"By making uſe of this inſtrument, I am obliged to keep the kite up no longer than it is neceſſary to charge the phial, in order to obſerve the quality of the electricity in the atmoſphere; for after the kite has been drawn in, and brought home, I can then examine the electricity of the inſide of the phial, which is the ſame as that of the kite. When the electricity of the kite is very ſtrong, I fix a chain communicating with the ground, at about ſix inches diſtance from the ſtring, which may carry off its electricity in caſe this ſhould increaſe ſo much as to put the byſtanders in danger."

75 Great qu tity of el tricity brought down fr a cloud.

With all his caution, however, it ſeems Mr Cavallo could not always avoid danger, even when there was no thunder; as appears from the following account. "October 18. 1775. After having rained a great deal in the morning and night before, the weather became a little clear in the afternoon, the clouds appearing ſeparated, and pretty well defined. The wind was weſt, and rather ſtrong, and the atmoſphere in a temperate degree of heat. In theſe circumſtances, at three P. M. I raiſed my electrical kite with 360 feet of ſtring. After the end of the ſtring had been inſulated, and a leather ball covered with tin-foil had been hanged to it, I tried the power and quality of the electricity, which appeared to be poſitive and pretty ſtrong. In a ſhort time, a ſmall cloud paſſing over, the electricity increaſed a little; but the cloud being gone, it decreaſed again to its former degree. The ſtring of the kite was now faſtened by the ſilk lace to a poſt in the yard of the houſe, and I was repeatedly charging two coated phials and giving ſhocks with them. While I was ſo doing, the electricity, which was ſtill poſitive, began to decreaſe, and in two or three minutes it became ſo weak that it could hardly be perceived with a very ſenſible cork-ball electrometer. Obſerving at the ſame time, that a large and black cloud was approaching the zenith (which, no doubt, cauſed the decreaſe of electricity), indicating imminent rain, I introduced the end of the ſtring through a window in a firſt-floor room, wherein I faſtened it by the ſilk lace to an old chair. The quadrant electrometer was ſet upon the ſame window, and was by means of a wire connected with the ſtring of the kite. Being now three quarters after three o'clock, the electricity was abſolutely imperceptible: however, in about three minutes time it became again perceptible; but, upon trial, was now found to be negative. It is therefore plain, that its ſtopping was nothing more than a change from poſitive to negative; which was evidently occaſioned by the approach of the cloud, part of which by this time had reached the zenith of the kite, and the rain alſo had begun to fall in large drops. The cloud alſo came farther on; the rain increaſed; and the electricity keeping pace with it, the electrometer ſoon arrived at 15°. Seeing now that the electricity was pretty ſtrong, I began again to charge the two coated phials, and to give ſhocks with them; but the phials had not been charged above three or four times, before I perceived that the index of the electrometer was arrived at 35°, and was keeping ſtill increaſing. The ſhocks being now very ſmart, I deſiſted from charging the phials any longer; and, conſidering the rapid advance of the electricity, thought to take ry.

take off the inſulation of the ſtring, in caſe that, if it ſhould increaſe farther, it might ſilently be conducted to the earth without cauſing any bad accident by being accumulated in the inſulated ſtring. To effect this, as I had no proper apparatus near me, I thought to remove the ſilk lace, and faſten the ſtring itſelf to the chair. Accordingly I diſengaged the wire that connected the electrometer with the ſtring; laid hold of the ſtring; untied it from the ſilk lace, and faſtened it to the chair: but while I effected this, which took up leſs than half a minute of time, I received about 12 or 15 very ſtrong ſhocks, which I felt all along my arms, in my breaſt, and legs; ſhaking me in ſuch a manner, that I had hardly power enough to effect my purpoſe, and to warn the people in the room to keep their diſtance. As ſoon as I took my hands off the ſtring, the electricity (in conſequence of the chair being a bad conductor) began to ſnap between the ſtring and the ſhutter of the window, which was the neareſt body to it. The ſnappings, which were audible at a good diſtance out of the room, were at firſt iſochronous with the ſhocks which I had received; but, in about a minute's time, oftener; ſo that the people of the houſe compared their ſound to the rattling noiſe of a jack going when the fly is off. The cloud now was juſt over the kite; it was black, and well defined, almoſt of a circular form, its diameter appearing to be about 40°. The rain was copious, but not remarkably heavy. As the cloud was going off, the electrical ſnapping began to weaken, and in a ſhort time became inaudible. I went then near the ſtring, and finding the electricity weak, but ſtill negative, I inſulated it again, thinking to keep up the kite ſome time longer: but obſerving that another larger and denſer cloud was approaching towards the zenith, and I had then no proper apparatus at hand to prevent every poſſible bad accident, reſolved to pull the kite in: accordingly a gentleman who was by me began pulling it in, while I was winding up the ſtring. The cloud was now very nearly over the kite; and the gentleman told me that he had received one or two ſlight ſhocks in his arms; and that, if he was to receive another, he would certainly let the ſtring go: upon which I laid hold of the ſtring, and pulled the kite in as faſt as I could without any farther obſervation; being then ten minutes after four o'clock.—N. B. There was neither thunder nor lightning perceived that day, nor indeed for ſome days before or after."

From his obſervations on the electricity of the atmoſphere, Mr Cavallo deduces the following concluſions.

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" 1. That there is in the atmoſphere at all times a quantity of electricity; for whenever I uſe the abovementioned inſtrument, it always acquires ſome electricity.

" 2. That the electricity of the atmoſphere, or fogs, is always of the ſame kind, namely, poſitive; for the electrometer is always negative, except when it is evidently influenced by heavy clouds near the zenith.

" 3. That, in general, the ſtrongeſt electricity is obſervable in thick fogs, and alſo in froſty weather; and the weakeſt, when it is cloudy, warm, and very near raining: but it does not ſeem to be leſs by night than in the day.

Theory.

" 4. That in a more elevated place the electricity is ſtronger than in a lower one; for having tried the atmoſpherical electrometer both in the ſtone and iron gallery on the cupola of St Paul's cathedral, I found that the balls diverged much more in the latter than in the former leſs elevated place. Hence it appears, that if this rule takes place at any diſtance from the earth, the electricity in the upper regions of the atmoſphere muſt be exceedingly ſtrong."

The concluſions drawn from the experiments with the kites, are as follow.

" 1. The air appears to be electrified at all times; its electricity is conſtantly poſitive, and much ſtronger in froſty than in warm weather; but it is by no means leſs in the night than in the day time.

" 2. The preſence of the clouds generally leſſens the electricity of the kite; ſometimes it has no effect upon it; and it is very ſeldom that it increaſes it a little." To this the above mentioned inſtance is a moſt remarkable exception.

" 3 When it rains, the electricity of the kite is generally negative, and very ſeldom poſitive.

" 4. The aurora borealis ſeems not to affect the electricity of the kite.

" 5. The electric ſpark taken from the ſtring of the kite, or from any inſulated conductor connected with it, eſpecially when it does not rain, is very ſeldom longer than a quarter of an inch; but it is exceedingly pungent. When the index of the electrometer is not higher than 20°, the perſon that takes the ſpark will feel the effect of it in his legs; it appearing more like the diſcharge of an electric jar than the ſpark taken from the prime conductor of an electrical machine.

" 6. The electricity of the kite is generally ſtronger or weaker, according as the ſtring is longer or ſhorter; but it does not keep any exact proportion to it. The electricity, for inſtance, brought down by a ſtring of 100 yards, may raiſe the index of the electrometer to 20, when, with double that length of ſtring, the index of the electrometer will not go higher than 25.

" 7. When the weather is damp, and the electricity is pretty ſtrong, the index of the electrometer, after taking a ſpark from the ſtring, or preſenting the knob of a coated phial to it, riſes ſurpriſingly quick to its uſual place; but in dry and warm weather it riſes exceedingly ſlow."

II. The ſecond poſition requiſite for eſtabliſhing Dr Franklin's theory is, " That glaſs and other electric ſubſtances, though they contain a great deal of electric matter, are nevertheleſs *impermeable* by it." This aſſertion evidently has a contradictory appearance. It is very difficult, if not impoſſible, to conceive, that any ſubſtance can be full of a fluid, and yet impermeable by that fluid; eſpecially when we continually talk of putting in an additional quantity into one ſide, and taking out of the other. Nay, what is ſtill more extraordinary, the thinner the glaſs is, *i. e.* the *leſs* quantity of electric matter it can contain, the *more* we are able to put into it; for the thinner a glaſs is, the more eaſily does it receive a high charge.

77
Arguments for the impermeability of glaſs refuted.

The chief arguments for the impermeability of glaſs by the electric fluid are drawn from the phenomena of the Leyden phial. It is indeed very plain, that there is in that caſe an expulſion of fire from the outſide at the

the ſame time that it is thrown upon the inſide. This appears from numberleſs experiments, but is moſt readily obſervable in the following. Let a coated phial be ſet upon an inſulating ſtand, and the knob of another phial brought near the coating of the firſt. As ſoon then as the electric ſparks are diſcharged from the prime conductor to the knob of the firſt bottle, an equal number will be obſerved to proceed from the coating of the firſt to the knob of the ſecond. This is very remarkable, and an unphiloſophical obſerver will ſcarce ever fail to conclude, that the fire runs directly through the ſubſtance of the glaſs. Dr Franklin, however, concludes that it does not, becauſe there is found a very great accumulation of electricity on the inſide of the glaſs, which diſcovers itſelf by a violent flaſh and exploſion when a communication is made between the outſide and inſide coatings. But it muſt be obſerved, that there is here no other reaſon for concluding the glaſs to be impermeable, except that we *ſuppoſe* the electric matter to be *accumulated* on one ſide of the glaſs, and *deficient* on the other. If this ſuppoſition therefore cannot be proved, the evidence of ſenſe, which indeed is very ſtrong in favour of the permeability, muſt undoubtedly preponderate. It is ſaid, indeed, that if the glaſs was permeable by the electric matter, a phial would be diſcharged immediately after being charged, or rather could never be charged at all; becauſe the matter would no ſooner be thrown upon one ſide than it would fly off from the other. This ſuppoſition, however, depends entirely upon the abovementioned one, namely, that in bodies *poſitively* electrified there is an *accumulation*, and in ſuch as are *negatively* electrified there is a *deficiency* of fluid; which never can be proved.

Another argument againſt the permeability of glaſs and other electrics is, that coated phials, it is ſaid, ſtanding upon electric ſubſtances, cannot be charged. This, however, ſeems to be very much exaggerated. A phial, though ever ſo perfectly inſulated, will always receive a charge from a machine that acts very powerfully. Nay, it is certain, that though a phial is placed in ſuch a manner, that both its knob and outſide coating are in contact with the prime conductor, it will ſtill receive a charge; much leſs indeed in this caſe than in any other, but ſtill the ſhock will be perceptible.

In 1759, Mr Wilſon read a paper before the Royal Society, in which the permeability of glaſs by the electric fluid was aſſerted. The experiments from which he deduced this concluſion were the following. He took a very large pane of glaſs, a little warmed; and holding it upright by one edge, while the oppoſite edge reſted upon wax, he rubbed the middle part of the ſurface with his finger, and found both ſides electrified *plus*. He accounted for this from the electrical fluid paſſing through the glaſs from his finger to the oppoſite ſide. But here Dr Prieſtley obſerves, that on Franklin's principles it ought to be ſo. If one ſide be rubbed by the finger, it acquires from it ſome electrical fluid. This being ſpread on the glaſs as far as the rubbing extended, repels an equal quantity of that contained in the other ſide of the glaſs, and drives it out on that ſide, where it ſtands as an atmoſphere, ſo that both ſides are found poſitively electrified. Mr Wilſon alſo tried another experiment, which ſeemed more deciſive than the former: Having by him a pane of glaſs, one ſide of which was rough and the other ſmooth, he rubbed it ſlightly on one ſide; upon doing which, both ſides were electrified *minus*. This alſo Dr Prieſtley attempts to reconcile with Franklin's hypotheſis. "As the electric fluid, contained in the glaſs (ſays he), is kept equal in both ſides by the common repulſion; if the quantity in one ſide is diminiſhed, the fluid in the other ſide, being leſs repelled, retires *inward*, and leaves that ſurface alſo *minus*." But here it is impoſſible to avoid obſerving, that Dr Prieſtley's own words, in the ſtrongeſt manner, militate againſt the doctrine he means to eſtabliſh. The quantity of fluid in one ſide being diminiſhed, that on the other, he ſays, *retires inward*. But into what does it retire? if into the ſubſtance of the glaſs, then the glaſs is undoubtedly permeable by it; and this is the very thing which Dr Prieſtley argues againſt.

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III. "The electric matter violently repels itſelf, and attracts all other matter." The proofs of this poſition are chiefly derived from the following experiment, and others of a ſimilar kind. Let a ſmooth piece of metal be inſulated, and bring an excited glaſs tube near one end of it. A ſpark of poſitive electricity will be obtained from the other end; after which, if the tube is ſuddenly removed, the metal becomes electrified negatively. Here, then, it is ſaid, is a plain repulſion of one part of the electric fluid by another. That contained in the tube repels the fluid contained in the neareſt end of the metal; of conſequence it is accumulated in the other end, and when the tube is removed, the metal is found to be deprived of part of its natural quantity of electricity, or is electrified negatively.—On ſuch experiments as this, however, it is obvious to remark, that we ought firſt to prove that poſitive electricity conſiſts in an *accumulation*, and negative electricity in a *deficiency*, of the electric fluid. But while this is only *ſuppoſed*, it is impoſſible that any proofs drawn from the ſuppoſition can be concluſive.

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IV. "By the excitation of an electric, the equilibrium of the fluid contained in it is broken, and one part is overloaded with electricity, while the other contains too little." This poſition is entirely hypothetical. No electrician hath yet explained, in a ſatisfactory manner, how the fluid is procured by the excitation of glaſs or any other electric ſubſtance. Dr Prieſtley, inſtead of giving an explanation, propoſes ſeveral queries concerning it. Mr Cavallo tells us, that the act of excitation *pumps* as it were the electric fluid from the rubber, and conſequently from the earth. He adds, "By what mechaniſm one body extracts the electric fluid from another, is not yet known. The celebrated Father Beccaria ſuppoſes, that the action of rubbing increaſeth the capacity of the electric, *i. e.* renders that part of the electric which is actually under the rubber, capable of containing a greater quantity of electric fluid: hence it receives from the rubber an additional ſhare of fluid, which is manifeſted upon the ſurface of the electric, when that ſurface is come out from the rubber; in which ſtate it loſes, or, as it were, contracts its capacity. Signior Beccaria's experiment to prove this ſuppoſition is the following. He cauſed a glaſs plate to be rubbed by a rubber applied on one ſide of the plate, while it was turning vertically; and holding at the ſame time a linen thread on the other ſide of the plate

plate juſt oppoſite to the rubber, he obſerved that the thread was not attracted by that part of the glaſs which correſponded to the rubber, but by that which was oppoſite to the ſurface of the glaſs that had juſt come out from the rubber; which ſhows, that the fluid acquired by the glaſs plate did not manifeſt its power until the ſurface of the glaſs was come out from the rubber." But from this experiment it ſeems impoſſible to draw any concluſion concerning the capacity of glaſs either one way or other. It is evident, therefore, that whatever parts of Dr Franklin's hypotheſis reſt on this ſuppoſition concerning excitation, are entirely void of evidence.

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V. "Conducting bodies are permeable by the electric fluid through the whole of their ſubſtance, and do not conduct it merely over their ſurface." The proof moſt commonly adduced in favour of this poſition, is the following experiment. Take a wire of any kind of metal, and cover part of it with ſome electric ſubſtance, as roſin, ſealing-wax, &c. then diſcharge a jar through it, and it will be found that it conducts as well with as without the electric coating. This, ſays Mr Cavallo, proves that the electric matter paſſes through the ſubſtance of the metal, and not over its ſurface. A wire, adds he, continued through a vacuum, is alſo a convincing proof of the truth of this aſſertion. Even here, however, the proof, if impartially conſidered, will be found very defective. It is a fact agreed upon by all philoſophers, that bodies which to us are apparently in contact, do nevertheleſs require a very conſiderable degree of force to make them actually touch one another. Dr Prieſtley found that a weight of ſix pounds was neceſſary to preſs 20 ſhillings into cloſe contact, when lying upon one another on a table. A much greater weight was neceſſary to bring the links of a chain into contact with each other. It cannot be at all incredible, therefore, that a wire, though covered with ſealing-wax or roſin, ſhould ſtill remain at ſome little diſtance from the ſubſtance which covers it. The following experiments of Dr Prieſtley alſo ſeem to be much in favour of the ſuppoſition that the electric fluid paſſes chiefly over the ſurface of conducting ſubſtances.

"From the very firſt uſe of my battery (ſays he), I had obſerved a very black ſmoke or duſt to ariſe on every diſcharge, even when no wire was melted; and the braſs chain I made uſe of was of a conſiderable thickneſs. I obſerved, that a piece of white paper, on which lay the chain I was uſing to make the diſcharge, was marked with a black ſtain, as if it had been burnt, wherever it had touched it. I neglected the experiment, till, ſome time after, obſerving a very ſtriking appearance of the ſame kind, I was determined to attend to the circumſtances of it a little more particularly. I made my chain very clean, and wrapping it in white paper, I made a diſcharge of about 40 ſquare feet through it, and found the ſtain wherever it had touched the paper. Some time after I wrapped the paper, in the ſame manner, round a piece of braſs wire; but, making a diſcharge through it, ſaw no ſtain. To aſcertain whether this appearance depended upon the diſcontinuity of the metallic circuit, I ſtretched the chain with a conſiderable weight, and found the paper on which it lay, as the ſhock paſſed through it, hardly marked at all. Finding that it depended upon the diſcontinuity, I laid the chain upon white paper, making each extremity faſt with pins ſtuck through the links; and when I had made the diſcharge, obſerved that the black ſtains were directly oppoſite to the body of the wire that formed the chain, and not to the intervals, as I had ſometimes ſuſpected. A chain five feet four inches long, which weighed one ounce ſeventeen penny-weights four grains, loſt exactly half a grain after each diſcharge.

81
A chain ſhortened by the electric ſhock.

"In making the mark above-mentioned, I once happened to lay the chain ſo as to make it return at a ſharp angle, in order to impreſs the form of a letter upon the paper; and obſerved, that on the diſcharge, the part of the chain that had been doubled was diſplaced, and pulled about two inches towards the reſt of the chain. At this I was ſurpriſed, as I thought it lay ſo, that it could not ſlide by its own weight. Upon this I repeated the experiment with more accuracy. I ſtretched the whole chain along a table, laying it double all the way, and making it return by a very ſharp angle. The conſequence always was, that the chain was ſhortened about two inches, and ſometimes more, as if a ſudden pull had been given to it by both the ends. Suſpecting that the black ſmoke which roſe at every diſcharge, might come, not from the chain, but from the paper, or the table on which it lay, and which was probably burnt by the contact of it, I let the chain hang freely in the air; but, upon making the diſcharge, I obſerved the ſame groſs black ſmoke that had before riſen from the paper or the table. Fig. 76. repreſents the ſpots made upon the paper by a chain laid over it. The breadth of the ſpots is about the mean thickneſs of the wire of the chain, and *a b* marks the place to which that part of the chain which returned was thrown back by the diſcharge.

Plate CLXXVII.

"Being willing to try what would be the effect of laying the chain in contact with non-conductors, I dipped it in melted roſin till it had got a coating of conſiderable thickneſs. When it was quite ſtiff, I laid it carefully, without bending, upon white paper, and made the diſcharge through it. The roſin was inſtantly diſperſed from all the outſide of the chain, it being left as clean as if none had ever been put on. That with which the holes in the chain had been filled having been impelled in almoſt all directions, was beaten to powder; which, however, hung together but was perfectly opaque; whereas it had been quite tranſparent before this ſtroke. I next laid the chain upon a piece of glaſs, which was marked in the moſt beautiful manner wherever the chain had touched it; every ſpot the width and colour of the link. The metal might be ſcraped off the glaſs at the outſide of the marks; but in the middle part it was forced within the pores of the glaſs. On the outſide of this metallic tinge was the black duſt, which was eaſily wiped off.

From theſe experiments it would ſeem, that the electrical flaſh had paſſed over the ſurface of the chain rather than through its ſubſtance; ſeeing it threw off the roſin with ſuch extreme violence. The ſame thing appears from the manner in which electricity generally acts, which is not according to the ſolid contents of any ſubſtance, but according to the dimenſions of its ſurface. It is not to be doubted, however, but that, where a great quantity of electric matter is made to paſs along a very ſmall wire, it will enter the ſubſtance of the metal. This appears from the poſſibility of melting wires by the force of electric batteries, and even totally diſſipating them into ſmall globules. To accompliſh this, it is only neceſſary to connect the hook communicating with the outſide coating of a battery, containing at leaſt 30 ſquare feet of coated ſurface, with a wire that is about one-fiftieth part of an inch thick and about two feet long. The other end of it muſt be faſtened to one end of the diſcharging rod: this done, charge the battery; and then by bringing the diſcharging rod near its wires, ſend the exploſion through the ſmall wire, which by this means will be made red hot and melted. ſo as to fall upon the floor in different glowing pieces. When a wire is melted in this manner, ſparks are frequently ſeen at a conſiderable diſtance from it, which are red hot particles of the metal, that, by the violence of the exploſion, are ſcattered in all directions. If the force of the battery is very great, the wire will be entirely diſperſed by the exploſion, ſo that none of it can be afterwards found. If it is required to melt ſuch particles as cannot eaſily be drawn into wires, ores, for inſtance, or grain-gold, they may be ſet in a train upon a piece of wax: they are then to be put into the circuit, and an exploſion ſent through them, which, if ſufficiently ſtrong, will melt them as well as the wires. If a wire is ſtretched by weights, and a ſhock is ſent through it which renders it juſt red hot, the wire, after the exploſion, is found to be conſiderably lengthened.

82 Dr Franklin's hypotheſis concerning poſitive and nagative electricity cannot be proved.

VI. The laſt poſition on which Dr Franklin's theory depends, and which indeed may be called the foundation of the whole, is, "That poſitive electricity is an accumulation, or too great a quantity, of electric matter contained in a body; and negative electricity is when there is too little." Of this, however, there is not one ſolid proof; and all attempts that have hitherto been made to prove it, are only arguing in a circle, or proving the thing by itſelf. Thus, for inſtance, a body electrified poſitively, attracts one that is electrified negatively; becauſe the firſt has too much, and the other too little, electric matter. But how do we know that one has too much, and the other too little, electricity? Becauſe they attract each other. Again it has been proved, that when a phial is electrified poſitively, there is as conſtant a ſtream of fire from the outſide coating, as there is from the conductor to the inſide coating. Therefore, it is ſaid, the outſide of the glaſs has too little, and the inſide too much, electricity. But how is this known to be the caſe? Becauſe glaſs is impermeable by the electric fluid. And how is glaſs known to be impermeable? Becauſe, in the above experiment, one ſide has too much, and the other too little, electricity. Thus in every inſtance, the arguments for Dr Franklin's hypotheſis return into themſelves, and no concluſion can be drawn from them. In the ſubſequent ſection, the nature of the electric fluid is particularly conſidered, where the improbability of its ever being accumulated in the ſubſtance of ſolid bodies will more plainly appear.

## SECT. VI. *An Inquiry into the Nature of the Electric Fluid; with an Attempt to explain the principal Phenomena of Electricity, from the known Laws by which other Fluids are obſerved to act upon one another.*

In making this inquiry, or indeed any other, it is proper to take for granted as little as poſſible. No poſition ſhould be aſſumed as the baſis of any reaſoning whatever, except what has been proved by inconteſtable facts. In the preſent caſe, therefore, it is ſufficient to aſſume as a fact what hath been already proved by innumerable experiments, namely, That the air, the earth, and ſea, all contain great quantities of electric fluid. The queſtion which moſt naturally ſuggeſts itſelf when this is once admitted, is, Whence hath the electric fluid come? is it eſſentially inherent in theſe bodies, or hath it come from without? This cannot be reſolved, without conſidering the nature of the fluid itſelf, and whether it is analogous to any other which is more generally known.

### § 1. *Proofs of the Identity of the Electric Fluid and Elementary Fire or Light of the Sun.*

The ſimilarity between the electric matter and fire, naturally ſuggeſted to the firſt obſervers, that it was no other than elementary fire, which pervaded all ſubſtances, as we have already mentioned. This, however, was objected to; and the principal objection was, that though the electric matter emitted light, and had the appearance of fire, it nevertheleſs wanted its moſt eſſential quality, namely, *burning*. In particular, the blaſt which comes from an electrified point, feels cold inſtead of being hot; and where great quantities of the fluid are forced with violence through certain ſubſtances, and thus ſet them on fire, it was thought that the fire might be occaſioned by the internal commotion excited among their ſmall particles. This objection, however, ſeems now to be totally removed. The diſpute concerning the preferable utility of pointed or knobbed conductors for ſecuring buildings from lightning, occaſioned the fitting up of a more magnificent apparatus than had ever appeared before. An immenſe conductor was conſtructed at the expence of the board of ordnance, and ſuſpended in the *Pantheon*. It conſiſted of a great number of drums covered with tin-foil, which formed a cylinder of above 155 feet in length, and more than 16 inches in diameter; and to this vaſt conductor were occaſionally added 4800 yards of wire. The electric blaſt from this machine fired gun-powder in the moſt unfavourable circumſtances that can be imagined, namely, when it was drawn off by a ſharp point, in which caſe it has generally leſs force than in any other. The method of doing this was as follows. Upon a ſtaff of baked wood a ſtem of braſs was fixed, which terminated in an iron point at the top. This point was put into the end of a ſmall tube of Indian paper, made ſomewhat in form of a cartridge, about an inch and a quarter long, and two-tenths of an inch in diameter. When the cartridge was filled with common gun-powder, unbruiſed, a wire communicating with the earth was then faſtened to the bottom of the braſs ſtem. The charge in the great cylinder being continually kept up by the motion of the wheel, the top of the cartridge was brought

83 Gun-po der fire the ele blaſt.

very near the drums, ſo that it frequently even touched the tin-foil with which they were covered. In this ſituation a ſmall faint luminous ſtream was frequently obſerved between the top of the cartridge and the metal. Sometimes this ſtream would ſet fire to the gun-powder the moment it was applied; at others, it would require half a minute or more before it took effect. But this difference in time was ſuppoſed to be owing to ſome ſmall degree of moiſture in the powder or the paper, which was always unfavourable to the experiment. Tinder was fired much more readily.

As it therefore appears, that the electric fluid, when it moves through bodies either with great rapidity, or in very great quantity, will ſet them on fire, it ſeems ſcarce diſputable, that this fluid is the ſame with the element of fire. For further proofs of this opinion, which is now adopted by ſome very eminent philoſophers, ſee the articles Fire and Heat. See alſo Chemistry-*Index*. This being once admitted, the ſource from whence the electric fluid is derived into the earth and atmoſphere, muſt be exceedingly evident, being no other than the ſun, or ſource of light itſelf. The vaſt quantity of light which continually comes from him to the earth muſt of neceſſity be abſorbed by that opaque body, at leaſt in great part. It is impoſſible it can remain there, becauſe there is a perpetual ſucceſſion of new quantities coming from the ſun. It muſt be obſerved, however, that as this fluid receives a great number of different directions after once it enters the earth, it cannot appear in its natural form of fire or light, till it receives a new motion ſimilar to what it had when proceeding from the ſun. The ſolar light only burns, or produces heat, when diverging from a centre, or converging towards one. The heat is always greateſt at the central point; and even there, no heat is produced except where the light paſſes through a reſiſting medium. In thoſe caſes likewiſe the electric fluid burns. When diſcharged with violence from an electrified bottle, it flies out on all ſides, and then will fire gun-powder, or other combuſtible ſubſtances. The ſame thing it will do when converging towards a point, if in ſufficient quantity, as was obſerved in the experiment with the large conductor above mentioned. But when the electric fluid neither meets with any conſiderable reſiſtance, diverges from a centre, nor converges towards one, it is almoſt always inviſible, and without heat. A moſt remarkable proof of this we have, even when a vaſt quantity of electric matter is forced to go through a very ſmall wire. Dr Prieſtley tells us he had once an opportunity of obſerving what part of the conductors which form an electric circuit are moſt affected by the exploſion. Upon diſcharging a battery of 51 ſquare feet thro' an iron wire nine inches long, the whole of it was glowing hot, and continued ſo for ſome ſeconds. The middle part grew cool firſt, while both the extremities were ſenſibly red. When the wire was afterwards examined, both the extremities were found quite melted; an inch or two of the part next to them was extremely brittle, and crumbled into ſmall pieces on being handled; while the middle part remained pretty firm, but had quite loſt its poliſh, ſo that it looked darker than before. This is preciſely what would have happened, had both ends been put into a common fire. We are very ſure, that the ſame quantity of electric matter paſſed through the middle of the wire, that entered one end of it and went out at the other. Why then did it not produce the ſame degree of heat in the middle that it did at each end? The reaſon is plain: At one end it was in a ſtate of *convergence* from the battery to the point of the wire; at the other, it was in a ſtate of *divergence* from the point of the wire to the battery. At the points, therefore, an intenſe heat was produced; but in the middle, where the fluid neither converged nor diverged, but moved forwards in a parallel direction, the heat was much leſs. Now we know that this is the caſe with the ſolar light itſelf. At the focus of a burning-glaſs there is an intenſe heat both where the convergence ends and the divergence begins. But where this divergence conſiderably ceaſes, and the motion of the light becomes more parallel, the heat is vaſtly diminiſhed. The caſe is the ſame with a common fire, and with all burning bodies; for heat never acts but from a centre, and is always greateſt at the central point. It is true, that we can never produce electric fire without at the ſame time producing a violent ſhock exceedingly different from the *burning* of common fire. But the reaſon of this is, that we cannot produce a divergence in a ſtream of electric matter, without at the ſame time giving it ſuch a motion in ſome other direction, that its impetus becomes very perceptible. If it was in our power to make the flaſh produced by an electric bottle keep its place, we cannot ſuppoſe that any ſhock, or other ſenſation than heat, would be felt. But there is no poſſibility of hindering it from flying with prodigious celerity from one ſide of the bottle to the other. Therefore, as it is neither in a ſtate of divergence nor convergence, except where it comes out from and enters into the bottle, no ſenſation is perceived except what ariſes from its change of place; and hence it is ſaid, that the electric matter hath no heat.

34 on of lectric er and com- 1.

### § 2. *The Identity of Electric Matter and Light farther conſidered; with ſome poſitive Proofs, that Electric Subſtances are actually penetrated by the Electric Fluid.*

85 Objection concerning the impenetrability of glaſs anſwered.

The only objection of any ſtrength which can ariſe to the identity of the electric fluid and light is, the ſurpriſing eaſe with which the latter penetrates glaſs, and the ſeeming ſtop which is put to the motions of the former when a piece of glaſs or any other electric ſubſtance is preſented to it. Here, however, it muſt be obſerved, that light, as proceeding from a luminous body, muſt be regulated by very different laws from light which is abſorbed by opaque bodies, and conſequently ſubjected to motions quite different from what it originally had. Water, the only fluid with which we are very well acquainted (tho' all others we know ſeem to be regulated by the ſame laws), is capable of two very different motions. The one is a rectilinear one, by which great quantities of it run from one place to another. The other is not ſo eaſily explained. It may, however, be very readily obſerved, by throwing a ſmall ſtone into a pool of water. A great number of concentric circles will be propagated from the place where the ſtone fell, as from a centre, which will gradually grow larger and larger. If another ſtone is thrown in at ſome diſtance, ſimilar circles will proceed from the place where it fell. Theſe will meet with the former, and croſs them without interfering with each other in the leaſt. It is certain, however, that two ſtreams of water ruſhing oppoſite to one another, would ſhatter and deſtroy each other. If, therefore, there is a difference in the motion of the electric fluid when it burns, and when it does not (which there certainly is), we may eaſily ſuppoſe it poſſible, that glaſs ſhould obſtruct one kind of motion and not another: In which caſe, the glaſs would ſeem to be permeable by the fluid when manifeſting itſelf by the firſt kind of motion, and not ſo when it manifeſts itſelf by the other.

86 Surpriſing experiments concerning the tranſparency of bodies.

It hath commonly been thought, that the tranſparency of bodies depends upon the rectilinear direction of their pores, and opacity upon the ſituation of them in ſome other direction. Electrical experiments, however, have ſhown that this is not the caſe. Sealing-wax and pitch are as opaque bodies as we are acquainted with; yet in Mr Haukſbee's experiments, mentioned n° 4. theſe ſubſtances were both rendered tranſparent by the action of the electric fluid. Theſe experiments are confirmed by ſome others ſtill more ſurpriſing, mentioned by Dr Prieſtley. See alſo below Sect. VIII. One was made by S. Beccaria. He diſcharged an electric ſhock through ſome braſs duſt ſprinkled between two plates of ſealing-wax. The whole was perfectly luminous and tranſparent. The moſt extraordinary experiment, however, was made by Dr Prieſtley himſelf, of which he gives the following account. "I laid a chain in contact with the outſide of a jar lightly on my finger, and ſometimes kept it at a ſmall diſtance by means of a thin piece of glaſs; and, if I made the diſcharge at the diſtance of about three inches, the electric fire was viſible on the ſurface of the finger, giving it a ſudden concuſſion, which ſeemed to make it vibrate to the very bone; and when it happened to paſs on that ſide of the finger which was oppoſite to the eye, the whole ſeemed perfectly *tranſparent* in the dark."

87 Conſequences from them.

Experiments of this kind, though they have not hitherto been much purſued by electricians, ſeem to be more worthy of notice than almoſt all others. One conſequence which may be derived from them is, that there is in bodies, whether electric or non electric, a certain ſubtile medium, on the motion of which tranſparency depends. That is, when the medium is at reſt, the body is opaque; but when ſet in motion, it becomes tranſparent. This motion, we ſee, may be given in two different ways. One is by ſimple electrification *in vacuo*, according to Mr Haukſbee's experiments. The other is, by ſending the flaſh of an electrified bottle over their ſurface. In Dr Prieſtley's experiment, he could determine the motion to be of the vibratory kind; and hence we may eaſily conclude, that ſome bodies may be conſtructed in ſuch a manner, that they are capable of tranſmitting the vibrations of this fluid, but not any other kind of motion. Such kinds of bodies will be naturally tranſparent: but others, whoſe particles are diſpoſed in ſuch a manner that the vibrations cannot be propagated thro' them without conſiderable violence, are naturally opaque. The queſtion then only is, What is this ſubtile medium, the vibrations of which occaſion tranſparency? It is ſcarce poſſible to anſwer this queſtion in another manner than by ſaying, that it is the electric fluid. That it is this fluid which gives the power to electric ſubſtances, has never been denied. That the motion of this fluid along the ſurfaces of bodies throws another fluid within them into vibrations, is alſo evident from the experiments above mentioned. All bodies are confeſſed to have much of this fluid in their pores: therefore, if a quantity of the ſame matter paſſes over the ſurface of any body, it muſt affect what is within its ſubſtance with a motion of ſome kind or other; becauſe it affects that which lies on the outſide, and this cannot fail to affect all the reſt. This motion Dr Prieſtley's experiment determines to be of the vibratory or tremulous kind; and, indeed, it is natural to think it ſhould be ſo. The vibrations of the electrical fluid, therefore, conduct light through opaque bodies. But whatever fluid is conducted by the vibration of another, muſt itſelf alſo vibrate while it is ſo conducted. Light, therefore, vibrates when emitted from luminous bodies. In the preſent caſe, theſe vibrations are originally occaſioned by the electric flaſh. They are conducted thro' opaque bodies by the vibrations of the electric fluid. The air is alſo full of the ſame fluid. The air is naturally tranſparent; but we have ſeen that tranſparency conſiſts only in the eaſy tranſmiſſion of a vibratory motion of the electric fluid. The light, therefore, is perpetually conducted by means of the vibrations of this fluid: therefore, the vibrations of the electric fluid and light are the ſame; for no two fluids are always capable of ſetting one another in motion preciſely in the ſame manner, unleſs their nature is in all reſpects exactly the ſame.

88 Light pr ved to b vibrati the elect fluid.

Theſe experiments ſeem in the ſtrongeſt manner to prove the identity of the electric fluid and light, and that both are tranſmitted through electric as well as other ſubſtances. The reaſon, therefore, of the ſeeming ſtop, which is obſerved in our electrical operations by the intervention of glaſs, is, that in all artificial electricity, the fluid has a very conſiderable progreſſive motion, which cannot be eaſily propagated through the ſolid ſubſtance of any body, eſpecially where there is a pretty ſtrong reſiſtance on the other ſide; which ſhall afterwards be ſhown to be the caſe with this fluid when paſſing through electric ſubſtances.

### § 3. *Of the Paſſage of the Electric Fluid over the Surface, and through the Subſtance, of different Bodies.*

89 Dr Prie ley's exp riments vith ice

Dr Priestley hath made many very curious experiments concerning the diſcharging of electric ſhocks over the ſurface of different bodies; and finds, that by this means a battery may be made to diſcharge itſelf at a much greater diſtance than it would do if ſent directly through the air. The experiments were begun with ice; and he firſt accidentally diſcovered, that, when the ſhock of a common jar was diſcharged on a plate of ice, it would ſometimes run over the ſurface and ſtrike the chain directly on the other ſide. With a ſingle jar, however, the diſtance was not much greater than what it would have paſſed over in the uſual way; but, with a battery, it exceeded the uſual diſtance in a very great degree. Endeavouring to make a circular ſpot, ſuch as he had formerly made on metals, upon a piece of raw fleſh, he took a leg of mutton, and laying the chain that communicated with the outſide of the battery over the ſhank, he took the exploſion on the outward membrane, about ſeven inches from the chain; but was greatly ſurpriſed to obſerve the electric fire not

90 With ra fleſh;

to enter the fleſh, but to paſs in a body along the ſurface of it to come to the chain. Thinking that this might be occaſioned by the fatty membrane on which the exploſion was made, he again laid the chain in the ſame manner over the ſhank, and took the exploſion upon the muſcular fibres, where they had been cut off from the reſt of the body; but ſtill the fire avoided entering the fleſh, made a circuit of near an inch round the edge of the joint, and paſſed along the ſurface to come to the chain as before, though the diſtance was near 11 inches. Imagining that this effect was promoted by the chain lying lightly on the ſurface of the fleſh, and therefore not actually in contact with it, he took another exploſion upon the hook of the chain, which was thruſt into the fleſh. On this the fire entered the mutton; and as he held it in his hands, both his arms were violently ſhocked up to his ſhoulders.

The Doctor next determined to try the effect of different conducting ſubſtances in the ſame manner; and of theſe water was the moſt obvious. "Next day, (ſays he) I laid a braſs rod communicating with the outſide of the battery, very near the ſurface of a quantity of water (to reſemble the chain lying upon the ſurface of the fleſh, without being in contact with it), and, by means of another rod furniſhed with knobs, made a diſcharge on the ſurface of the water, at the diſtance of ſeveral inches from any part of the rod; when the electric fire ſtruck down to the water, and, without entering it, paſſed viſibly over its ſurface till it arrived at that part of the rod which was neareſt the water, and the exploſion was exceedingly loud. If the diſtance at which I made the diſcharge exceeded ſeven or eight inches, the electric fire entered the water, making a beautiful ſtar upon its ſurface, and yielding a very dull ſound. When I firſt made this experiment of the electric flaſh paſſing over the ſurface of water, I thought it neceſſary, that neither the piece of metal communicating with the outſide, nor that communicating with the inſide, of the jars, ſhould touch the water immediately before the diſcharge. But I afterwards found, that the experiment would anſwer, tho' either, or even both of them, were dipped in the water: for, in this caſe, the exploſion would ſtill prefer the ſurface to the water itſelf, if the diſtance was not very great; and would even paſs at a greater diſtance along the ſurface, when there was a nearer paſſage from one rod to the other in the water."

He afterwards tried to paſs the electric flaſh over the ſurfaces of a great number of different bodies, but found it impoſſible with many of them. He therefore imagined that this property of conducting a ſhock over its ſurface was peculiar to water and raw fleſh. It was found, however, that the flaſh paſſed over the ſurface of a touch-ſtone, and likewiſe over a piece of the beſt kind of iron ore, exceedingly ſmooth on ſome of its ſides. The piece was about an inch thick, and three inches in its other dimenſions. The full charge of a jar of three ſquare feet would not enter it. The exploſion paſſed over the ſurface of oil of vitriol, with a dull ſound and a red colour; but in all other caſes, if it paſſed at all, it was in a bright flame, and with a report peculiarly loud. It paſſed over the ſurface of the moſt highly rectified ſpirit of wine without firing it; but when too great a diſtance was taken, the electric fire entered the ſpirit, and the whole was in a blaze in a moment.

This was the caſe when ſuch ſubſtances were employed as are but indifferent conductors of electricity; raw fleſh, for inſtance, water, &c. When good conductors were uſed, ſuch as charcoal of different kinds, no remarkable appearances were produced. So far was the ſhock from paſſing viſibly over the ſurface of any metal, that, if the diſtance through the air, in order to a paſſage through the metal, was ever ſo little nearer than the diſtance between the two ſurfaces, it never failed to enter the metal; ſo that its entering the ſurface of the metal, and its coming out again, ſeemed to be made without obſtruction. If as much water was laid on a ſmooth piece of braſs as could lie upon it, it would not go over the ſurface of the water, but always ſtruck thro' the water into the metal. But if the metal lay at any conſiderable depth under the water, it would prefer the ſurface. It even paſſed over three or four inches of the ſurface of water as it was boiling in a braſs pot, amidſt the ſteam and bubbles, which ſeemed to be no hindrance to it. Animal fluids, however, of all kinds, ſeemed peculiarly to favour this paſſage of the electric matter over their ſurface; and the report of theſe exploſions was manifeſtly louder than when water was uſed. In all caſes of this kind, the report was conſiderably louder than when the diſcharge was made in the common way. The exploſions were obſerved by perſons out of the houſe, and in a neighbouring houſe, very much to reſemble the ſmart cracking of a whip. "But (ſays Dr Prieſtley) the ſound made by theſe exploſions, though by far the loudeſt that ever I heard of the kind, fell much ſhort of the report made by a ſingle jar, of no very great ſize, of Mr Rackſtrow's; who ſays, that it was as loud as that of a piſtol." He alſo obſerves, that when the electrical exploſion does not paſs over the ſurface of the water, but enters it, a regular ſtar is made upon the ſurface, conſiſting of ten or a dozen rays: and what is very remarkable, thoſe rays which ſtretch towards the braſs rod that communicates with the outſide of the battery are always longer than the reſt; and if the exploſion is made at ſuch a diſtance as to be very near taking the ſurface, thoſe rays will be four or five times longer than the reſt, and a line bounding the whole appearance will be an ellipſis, one of whoſe foci is perpendicularly under the braſs knob with which the diſcharge is made.

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Circular ſpots produced by electrical exploſions.

When an electric battery is diſcharged upon ſmooth pieces of metal, the effects are very different from any of thoſe we have yet mentioned. Dr Prieſtley having conſtructed ſome large batteries, determined to try what would be the effects of a very great electric power diſcharged upon metals and other ſubſtances; and, in the courſe of his random experiments, he made the following diſcoveries. "June 13. 1766 (ſays he), after having diſcharged a battery of about 40 ſquare feet with a ſmooth braſs knob, I accidentally obſerved upon it a pretty large circular ſpot, the centre of which ſeemed to be ſuperficially melted, in a great number of dots; larger near the centre, and ſmaller at a diſtance from it. Beyond this ſpot was a circle of black duſt which was eaſily wiped off: but what I was moſt ſtruck with was, that after an interruption of melted places, there was an entire and exact circle of ſhining dots, conſiſting of places ſuperficially melted like thoſe at

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the centre. The appearance of the whole, excluſive of the black duſt, is repreſented Plate CLXXVII. fig. 75. n° 1.

"June 14th, I took the ſpot upon ſmooth pieces of lead and ſilver. It was in both caſes like that on the braſs knob; only the central ſpot on the ſilver conſiſted of dots diſpoſed with the utmoſt exactneſs, like radii from the centre of a circle, each of which terminated a little ſhort of the external circle. I took the circular ſpot upon poliſhed pieces of ſeveral metals with the charge of the ſame battery, and obſerved that the cavities in ſome of them were deeper than in others; as I thought in the following order, beginning with the deepeſt, tin, lead, braſs, gold, ſteel, iron, copper, ſilver. I will not be poſitive as to the order of ſome of the metals; but ſilver was evidently not affected a fourth part ſo much as gold, and much leſs than any of the others. The circles were marked as plain, but the impreſſion was more ſuperficial.

"I alſo made the exploſion between a piece of lead juſt ſolid after melting, and another ſmooth piece that I had kept a conſiderable time. The piece of freſh lead was melted more than the other, but there was no other difference between them. The ſemimetals, as biſmuth and zinc, received the ſame impreſſion as the proper metals; being melted nearly as much as iron. I made three diſcharges between a piece of highly poliſhed ſteel and a piece of very ſmooth iron, and in all caſes thought the ſteel was more deeply melted than the iron.

"Preſently after I had obſerved the ſingle circle, I imagined, that, whatever was the cauſe of the appearance, it was not improbable but that two or more concentric circles might be procured, if a greater quantity of coated glaſs was uſed, or perhaps if the exploſion was received upon metals that were more eaſily fuſed than braſs. Accordingly, June 27, taking the moderate charge of a battery, conſiſting of about 38 ſquare feet, upon a piece of tin, I firſt obſerved a ſecond outer circle, at the ſame diſtance from the firſt, as the firſt was from the central ſpot. It conſiſted of very fine points hardly viſible, except when held in an advantageous light; but the appearance of the whole was very beautiful, and was ſuch as is repreſented Plate CLXXVII. fig. 75. n° 2.

"Having hitherto found the circles the moſt diſtinct on metals that melt with the leaſt degree of heat, I ſoon after procured a piece of that compoſition which melts in boiling water; and having charged 60 ſquare feet of coated glaſs, I received the exploſion with it, and found three concentric circles; the outermoſt of which was not quite ſo far from the next to it, as that was from the innermoſt. All the ſpace within the firſt circle was melted; but the ſpace was very well defined, and by no means like a central ſpot, which in this caſe was quite obliterated. The appearance of theſe three concentric circles is repreſented Plate CLXXVII fig. 75. n° 3. The diſtance at which the diſcharge was made occaſioned no difference in the diameter of theſe circular ſpots. When, by putting a drop of water upon the braſs rod communicating with the inſide of the battery, I made the diſcharge at the diſtance of two inches; the ſpot was juſt the ſame as if it had been received at the diſtance of half an inch, *i. e.* about a quarter of an inch in diameter. Attempting to ſend an electric ſhock over the ſurface of quickſilver or melted lead, I found that it would not paſs; though neither of the rods with which the diſcharge was made touched the metals. A dark impreſſion was made on the ſurfaces of both the quickſilver and the lead of the uſual ſize of the circular ſpot; and remained very viſible notwithſtanding the ſtate of fuſion in which the metals were."

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### § 4. *The Electric Fluid moves through the Subſtance of Electrics, though with difficulty. In moſt Caſes, it paſſes over the Surface of good Conductors.*

THIS will appear from a conſideration of the phenomena above mentioned, and ſome others. The electric moſt univerſally preſent is *air*. That the fluid pervades its ſubſtance is evident to our eye-ſight; for if a pointed body is placed on the prime conductor, and at the ſame time the cylinder is briſkly turned, a continual ſtream of blue fire will be obſerved to iſſue from the point. This is undoubtedly the fluid itſelf made viſible by the reſiſtance it meets with from the air. That the electric fluid in this caſe pervades the air to a conſiderable diſtance, is alſo evident from the different methods by which the air of a room may be electrified. One method is that above mentioned: One or more needles are fixed on the prime conductor, which is kept ſtrongly electrified for about 10 minutes. If, afterwards, an electrometer is brought into the room, the air will ſhow that it has received a conſiderable quantity of electricity; for the balls will ſeparate, and continue to do ſo even after the apparatus has been quite removed out of the room. Another method of electrifying the air is to charge a large jar and inſulate it; then connect a ſharp-pointed wire, or a number of them, with the knob of the jar; and make a communication from the outſide coating to the table. If the jar is charged poſitively, the air of the room will likewiſe ſoon become electrified poſitively; but if the jar is charged negatively, the air will alſo become negative. To this it may be replied, that the air is always full of conducting ſubſtances, and that by means of them the electricity is propagated from one part of the air to another. But whether this is the caſe or not, it is certain that the air, notwithſtanding all the conducting ſubſtances it may contain, is in fact an electric, and capable of receiving a charge like glaſs or any other electric ſubſtance. To this purpoſe there is a very curious experiment made in the following manner. Take two ſmooth boards, of a circular form, and each about three or four feet in diameter. Coat one ſide of each with tin-foil, which ſhould be paſted down and burniſhed, and turned over the edge of the board. Theſe boards muſt be both inſulated, parallel to one another, in a horizontal poſition. They muſt be turned with their coated ſides towards each other; and ſhould be placed in ſuch a manner as to be eaſily moved to or from each other; to do which, it will be proper to fix to one of the boards a ſtrong ſupporter of glaſs or baked wood, and to ſuſpend the other by ſilk ſtrings from the ceiling of the room; from which it may be lowered at pleaſure by means of a pulley. When theſe boards are placed in the manner above deſcribed, and about an inch diſtant from one another, they may be uſed exactly as the coatings of a pane of glaſs. If a ſpark is given from the conductor to the upper board, a ſpark will in-

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inſtantly be diſcharged from the lower one, if any conducting ſubſtance is preſented to it. By continuing to give ſparks to the upper board, and to take them from the lower one, the air between them will at laſt become charged like a piece of glaſs; and if a communication is made between them, they will explode, give the ſhock, &c. like glaſs.

In this experiment it ſeems impoſſible to deny that the air is penetrated by electric fluid. The diſtance of an inch is ſo ſmall, that it muſt appear ridiculous to ſay that this ſpace is penetrated only by a *repulſive power*, when in other caſes we plainly ſee the fluid penetrating it to three or four times that diſtance. The flat ſurface of the boards indeed makes the motion of the electric fluid through the plate of air gradual and equal, ſo that it is not ſeen to paſs in ſparks or otherwiſe; but this is neceſſary to its receiving a charge, as will be afterwards explained.

If one electric ſubſtance is penetrable by the electric fluid, we muſt be led ſtrongly to ſuſpect at leaſt, that all the reſt are ſo too. That roſin, pitch, ſealing-wax, &c. are ſo, hath been already proved; and from thence, if we reaſon analogically, we muſt conclude, that glaſs is likewiſe penetrable by it. A very ſtrong additional proof of this is, that the electric ſhock cannot be ſent over the ſurface of glaſs. If this ſubſtance was altogether impenetrable to the fluid, it is natural to think, that it would run over the ſurface of glaſs very eaſily. But inſtead of this, ſo great is its propenſity to enter, that a ſhock ſent through between two glaſs plates, if they are preſſed pretty cloſe together, always breaks them to pieces, and even reduces part of them to a powder like ſand. This laſt effect cannot be attributed to any other cauſe than the electric fluid entering the pores of the glaſs; and, meeting with reſiſtance, the impetus of its progreſſive motion violently forces the vitreous particles aſunder in all directions.

To this violent impetus of the electric fluid, when once it is ſet in motion, we may alſo with ſome probability aſcribe the burſting of electric globes, both ſuch as are made of glaſs, and other materials, in the act of excitation. Dr Prieſtley hath given ſeveral inſtances of this accident. "The fragments (ſays he) have been thrown with great violence in every direction, ſo as to be very dangerous to the byſtanders. This accident happened to Mr Sabbatelli in Italy, Mr Nollet in France, Mr Beraud at Lyons, Mr Boze at Wittemberg, Mr Le Cat at Rouen, and Mr Robein at Rennes. The air in the inſide of Mr Sabbatelli's globe had no communication with the external air, but that of the Abbe Nollet had. This laſt, which was of Engliſh flint glaſs, had been uſed for more than two years, and was above a line thick. It burſt like a bomb in the hands of a ſervant who was rubbing it, and the fragments, none of which were above an inch in diameter, were thrown to a conſiderable diſtance. The Abbe ſays, that all the globes which were burſt in that manner, exploded after five or ſix turns of the wheel; and he aſcribes this effect to the action of the electric matter making the particles of glaſs vibrate in a manner he could not conceive.

"When Mr Beraud's globe burſt (and he was the firſt to whom this accident was ever known to happen), he was making ſome experiments in the dark on the 8th of February 1750. A noiſe was firſt heard as of ſomething rending to pieces; then followed the exploſion; and when the lights were brought in, it was obſerved that thoſe places of the floor which were oppoſite to the equatorial diameter of the globe were ſtrewed with ſmaller pieces, and in greater numbers, than thoſe which were oppoſite to other parts of it. This globe had been cracked, but it had been in conſtant uſe in that ſtate above a year; and the crack had extended itſelf from the pole quite to the equator. The proprietor aſcribed the accident to the vibrations of the glaſs, and thought the crack had ſome way impeded theſe vibrations. When Mr Boze's globe broke, he ſays that the whole of it appeared, in the act of breaking, like a flaming coal. Mr Boulanger ſays, that glaſs globes have ſometimes burſt like bombs, and have wounded many perſons, and that their fragments have even penetrated ſeveral inches into a wall. He alſo ſays, that if globes burſt in whirling by the gun-barrel's touching them, they burſt with the ſame violence, the ſplinters often entering into the wall. The Abbe Nollet had a globe of ſulphur which burſt as he was rubbing it with his naked hands, after two or three turns of the wheel, having firſt cracked inwardly. It broke into very ſmall pieces, which flew to a great diſtance, and into a fine duſt; of which part flew againſt his naked breaſt, where it entered the ſkin ſo deep, that it could not be got off without the edge of a knife."

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Proofs of the electric fluid's paſſing over the ſurface of conductors.

From theſe appearances we muſt neceſſarily conclude, not only that the electric fluid moves within the ſubſtance of electric bodies, but that it ſometimes moves with extreme violence; ſo that its repulſive power ſeparates even the minuteſt particles from each other; and this could not happen without a thorough penetration of the electric body. It ſeems more difficult to prove, that the electric matter does not generally paſs directly through the ſubſtance of metals, but over their ſurface. A little conſideration, however, will ſhow, that this muſt very probably be the caſe. If we compare Dr Prieſtley's experiments on metals related in § 3. with the effects of the ſolar light collected in the focus of a burning-glaſs upon the ſame metals, we ſhall find a conſiderable degree of reſemblance. Under the article Burning-glass, it is obſerved, that, notwithſtanding the prodigious power of that concave mirror with which Mr Macquer melted platina, all bodies did not melt equally ſoon in the focus. In particular, poliſhed ſilver, though a very fuſible metal, did not melt at all. It is not to be doubted, that this was owing to the complete reflection of the light by the ſilver; and had poliſhed pieces of all the metals been tried, it is equally certain, that the difficulty of melting them would have been found exactly proportioned to their reflective power. Something like this happened with Dr Prieſtley; for ſilver was leſs touched by the electric exploſion than any other metal. The violent progreſſive motion of the fluid indeed forced it into the metal, but at the ſame time the reflective power of the ſilver hindered it from going ſo deep as it had done in the others. The caſe was ſtill more evident when melted lead and quickſilver were uſed. Theſe have a very great reflective power; and though by reaſon of the extreme violence wherewith the fluid ſtruck them, part of their ſubſtance might naturally have

have been ſuppoſed to be diſſipated in the hard metals, yet we find this was not the caſe. Only a black ſpot was made on the ſurface, and the fluid was immediately diſperſed, moſt probably over the ſurface of the metal.

It is not indeed eaſy to bring a deciſive proof in favour of this hypotheſis. The extreme ſubtility, and, in moſt caſes, inviſibility, of the electric fluid, render all reaſoning about its motions precarious. It is incredible, however, that this fluid ſhould paſs through the very ſubſtance of metallic bodies, and not be in the leaſt retarded by their ſolid particles. In thoſe caſes, where the ſolid parts of metals are evidently penetrated, i. e. when wires are exploded, there is a very manifeſt reſiſtance; for the parts of the wire are ſcattered about with violence in all directions. The like happened in Dr Prieſtley's circles made on ſmooth pieces of metal. Part of the metal was alſo diſperſed and thrown off, for the circular ſpots were compoſed of little cavities. If therefore the fluid was diſperſed throughout the ſubſtance; and not over the ſurface of the metal, it is plain, that a wire whoſe diameter was equal to one of thoſe circular ſpots, ought alſo to have been deſtroyed by an exploſion of equal ſtrength ſent through it. But this would not have been the caſe. A wire whoſe diameter is equal to one of thoſe circular ſpots repreſented in n° 1, 2, 3. fig. 75. Plate CLXXVII. would without injury conduct a ſhock much greater than any battery hitherto conſtructed could give. It is moſt probable therefore, that though violent flaſhes of electricity, which act alſo as fire, will enter into the ſubſtance of metals and conſume them; yet it immediately diſperſes itſelf over their ſurface, without entering the ſubſtance any more, till being forced to collect itſelf into a narrow compaſs it again acts as fire.

In many caſes, the electric fluid will be conducted very well by metals reduced to a mere ſurface, ſo that we can ſcarce ſay they have any thickneſs at all. A piece of white paper will not conduct a ſhock without being torn in pieces, as it is an electric ſubſtance. But a line drawn upon it with a black-lead pencil will ſafely convey the charge of ſeveral jars. It is impoſſible we can think that the fire here paſſes through the ſubſtance of the black-lead ſtroke. It muſt run over its ſurface; and if we conſider ſome of the properties of metals, we ſhall find, that there is very great reaſon for believing that their conducting power lies at their ſurface.

The metals are, of all terreſtrial ſubſtances, thoſe which reflect the light moſt powerfully. Sir Iſaac Newton hath ſhown that this reflective power they have not from their ſubſtance as metals, but from what he calls a *repulſive power*, ſpread equally over their ſurface. The exiſtence of this repulſive power hath already been taken notice of in ſeveral inſtances, particularly in that of a chain, whoſe links cannot be brought into contact with each other without a conſiderable degree of force. It is exceedingly probable, that the repulſive power by which the links of the chain are kept aſunder, and that by which the rays of light are reflected, are one and the ſame. As the electric fluid is known to pervade all ſubſtances, and metals as well as others, it ſeems alſo probable, that the repulſive and reflective power on the ſubſtance of metals is no other than the electric fluid itſelf in a quieſcent ſtate. Perhaps it may be thought abſurd to aſcribe the reflection of light to a ſubſtance of ſuch extreme fluidity and tenuity as the electric fluid is; but we find that the vacuum of an air-pump, a medium of nearly equal tenuity with the electric fluid (as will elſewhere be proved), is in ſome caſes capable of reflecting light very powerfully. Now it is certain, that nothing can be ſuppoſed to give ſuch an eaſy paſſage to the electric fluid as itſelf; becauſe it is the thinneſt and moſt ſubtile of all the ſubſtances we know, and therefore muſt make the leaſt reſiſtance. Hence the fluid ſlides over the ſurface of a piece of metal with ſurpriſing eaſe; and when a large ſurface of metal is electrified, the effect is proportionable to the extent of it, becauſe all that quantity of electric fluid which is ſpread over the ſurface, eaſily receives the motion communicated by the electrical machine.

The vacuum of an air-pump is found to be a very good conductor, and by means of it the motion of the fluid is rendered viſible. Hence this is brought as an argument that the electric fluid *always* paſſes through the ſubſtance of conductors. That it doth ſo in ſome caſes is indeed very evident, but it then meets with conſiderable reſiſtance; and, even in the preſent inſtance, the paſſing through the vacuum of an air-pump, where it is oppoſed by a conſiderable quantity of the ſame kind of fluid, gives ſuch a conſiderable reſiſtance, that it will prefer a paſſage along a metalline rod to one through a vacuum. With regard to charcoal, and other conductors of that kind, as they are very porous, and likewiſe compoſed of fine ſpiculæ, it is probable the fluid may run along the ſurface of the ſpiculæ, and at the ſame time through the ſubſtance of the coal. Even in paſſing over the beſt conductors, however, this fluid meets with ſome reſiſtance, as it will prefer a ſhort paſſage through the air to a long one through the beſt conductors.

### § 5. *The exceeding great Velocity and Strength of the Electric Fluid are not owing to a repulſive Power among its Particles, but to the mutual Action of the Air and Electric Fluid upon themſelves and one another.*

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The arguments for a repulſive power exiſting between the particles of the electric fluid are very inconcluſive. Some of them have been already taken notice of. The ſtrongeſt is that drawn from the appearance of the electric fire iſſuing from a point, or from any body highly electrified. In the open air this diverges exceſſively; and very often divides into ſeveral diſtinct rays, which by avoiding each other ſeem to be violently repulſive. That they are not ſo in reality, however, is plain from the appearance they have *in vacuo*; when, the reſiſtance of the atmoſphere being taken off, the electric light would have room to ſpread more widely. Fig. 27. Plate CLXXIV. repreſents an exhauſted receiver with an electrified wire diſcharging a ſtream of this fluid from itſelf, by means of its communication with a machine. If the electric matter then was really elaſtic, or endowed with a power repulſive of itſelf, it is impoſſible it could paſs in an uninterrupted column through an exhauſted receiver as in the figure. A column of air, if blown ſwiftly through the orifice of a ſmall pipe, will go forward a conſiderable way, if it is counterbalanced by air like itſelf on every ſide. But if ſuch a column enters a vacuum, what

what we call its *elaſticity*, occaſions it to be diſſipated in a moment, and equally diffuſed through the whole exhauſted receiver. But this by no means happens to the electric fluid; for even the ſmall divergency repreſented in the figure ſeems entirely owing to ſome quantity of air left in the air-pump. Dr Watſon, by means of a long bent tube of glaſs filled with mercury, and inverted, made all the bended part which was above the mercury the moſt perfect vacuum that could be made. This vacuum he inſulated; and one of the baſons of mercury being made to communicate with the prime conductor, when ſome non-electric ſubſtance touched the other, the electric matter pervaded the vacuum in a continued arch of lambent flame, and, as far as the eye could follow it, without the leaſt divergency. From theſe experiments it appears, that there is in the vacuum of an air-pump, as well as in the Torricellian vacuum, a fluid of nearly the ſame denſity with the electric one: that the electric fluid is not repulſive of itſelf, but is reſiſted by the atmoſphere; and therefore all appearances of electrical light are leſs bright *in vacuo* than in the open air; becauſe, the more reſiſtance the matter meets with, the brighter is the flaſh.

Thus, as long as a ſtream of electric fluid is moved through a medium of an equal denſity with itſelf, the equable preſſure of the fluid all round will keep the luminous ſtreams from diverging; but if the preſſure is taken off from any part of the receiver, the preſſure of the reſt will immediately force the ſtream to that place, as repreſented fig. 28. That it is by a preſſure of this kind, and not by any obſcure *attractive power*, that this is occaſioned, will be rendered very probable from the following example. Suppoſe a pot or kettle is boiling violently over a fire, and in ſuch a ſituation that there is very little agitation in the ſurrounding air. The equal preſſure of the atmoſphere will then force the ſteam ſtraight upwards in a cylindrical column; but if any object is brought near the edge of the pot, ſo that the preſſure of the atmoſphere is taken off on one ſide, the ſteam will be directly forced upon that body, or ſeemingly attracted by it. The electric matter therefore, being capable of having its motions reſiſted by the air, muſt immediately fly to that place where the reſiſtance is leaſt; but in the caſe above mentioned, this is beſt done by applying a conducting ſubſtance to the ſide of the receiver, or one along which the fluid can run downward to the earth. This, however, will be more fully explained when we ſpeak of the phenomena of the Leyden phial.

From this ſimple principle, *viz.* that fluids impelled by any force will always tend towards that place where there is the leaſt reſiſtance, moſt of the phenomena of electricity may be explained. The firſt thing to be conſidered is, From what ſource it originally derives the aſtoniſhing agility and ſtrength diſplayed in its motions. If it is granted that the electric fluid is the ſame with the ſolar light, the ultimate cauſe of its momentum muſt be the power by which the light of the ſun is emitted. As this power extends through regions of ſpace which to our conceptions are truly *infinite*, ſo muſt the power itſelf be; and it is plain, that by its equable action all round, throughout the whole ſpace thro' which the ſun's light is propagated, the preſſure of it upon all bodies muſt be equal all round, and conſequently it can neither move them one way nor another. But if, by the intervention of ſome other power, the preſſure is leſſened upon any particular part, a current of electric matter will ſet towards that part, with a force exactly proportioned to the diminution of the preſſure. Thus, in the common experiments of the air pump, when the air is exhauſted from a glaſs veſſel, the preſſure of the ſuperincumbent atmoſphere is directed towards every part of the glaſs; ſo that if it is of a flat ſquare ſhape, and not very ſtrong, it will certainly be broken. But after the air is exhauſted, the veſſel is diſcovered to be full of another ſubtile fluid of the ſame nature with the electric one *. If this could alſo be extracted from the veſſel, the preſſure on its ſides would neceſſarily be much greater, becauſe not only the atmoſphere, but the whole ſurrounding ether or electric matter, would urge towards the place; and it is not probable, that this preſſure could be reſiſted by any terreſtrial power whatever. The momentum of the electric matter therefore, in our experiments, depends on two cauſes, *viz.* the preſſure of the atmoſphere upon the electric matter, and the preſſure of one part of this matter upon another. The celerity with which it moves may be explained from its parts lying in contact with each other throughout the wide immenſity of ſpace. Hence the great tendency of the fluid to circulate; becauſe, from whatever point a ſtream of it is ſent off, there the preſſure is leſſened, and the ſtream, finding no place empty for its reception, muſt neceſſarily have a tendency to return to the place from whence it came, as there it meets with the leaſt reſiſtance; and hence, when a paſſage is opened for it, by which it can return to this point, it is urged thither with great violence, the equable preſſure is reſtored, and the artificial motion ceaſes.

### § 6. *The Manner in which an Electric Subſtance becomes excited, or diffuſes its Electric Virtue.*

THIS will eaſily appear from conſidering the means taken for the excitation of a common cylinder for electric experiments. The glaſs is a ſubſtance, as we have already ſeen, into which the electric matter is very apt to enter. To the ſurface of the glaſs is applied ſome amalgam ſpread on leather. This is a metallic ſubſtance which has an exceeding great reflective power, being that which is employed for ſilverizing looking-glaſſes. The electric fluid therefore runs over its ſurface with great eaſe, and there is always a certain quantity of this fluid in a ſtate of ſtagnation on its ſurface. At the place where the cylinder touches the amalgam, the air is excluded, and conſequently the electric fluid hath there a tendency to riſe more than at any other part of the ſurface where the atmoſphere preſſes with its full force. When the cylinder begins to turn, it neceſſarily forces before it a ſmall quantity of that electric matter which lay upon the ſurface of the amalgam. To underſtand this the more eaſily, we muſt conſider that property which glaſs has of tranſmitting the electric fluid through it, and refuſing it a paſſage along its ſurface. Thus we may conceive it to be formed of a vaſt number of exceedingly ſmall tubes placed cloſe to each other. If we ſuppoſe any ſubſtance made by art of ſuch a texture, we would find it impoſſible to pour water along its ſurface, though it would very eaſily run through it. If ſuch a ſubſtance was

* See Vacuum.

was made in the ſhape of a cylinder, and turned briſkly round, with its ſurface juſt touching a quantity of water contained in a veſſel, the conſequence would be, that the water would be ſcattered around in all directions. The caſe ſeems to be the ſame with the more ſubtile electric fluid. The glaſs cylinder throws out part of the electric fluid lying on the ſurface of the amalgam. This quantity is perpetually renewed from the conducting ſide of the rubber. The quantity which is thrown out cannot be conducted over the ſurface of the glaſs, nor can it paſs through it; becauſe it is reſiſted by the air in the inſide, and, in ſome meaſure, by the glaſs itſelf. It is alſo reſiſted by the air on the outſide; but as that reſiſtance is leſs than what is made by the air and glaſs both put together, the fluid naturally forces itſelf into the open air. Still, however, there neither is, nor can be, any *accumulation* of the matter itſelf. It cannot enter the air without diſplacing the electric matter which was there before. This will diſplace more of the ſame kind, and ſo on, till at laſt the motion is communicated to the electric matter lodged in ſome part of the earth. From thence it is propagated to the rubber of the electric machine, and thus a kind of circulatory motion is carried on. By the excitation of an electric ſubſtance, therefore, the fluid is not accumulated, but only ſet in motion. The reaſon of that ſeeming accumulation obſervable about the excited cylinder is, the reſiſtance which the fluid meets with from the air. This inſtantly produces a divergency in the ſtream of electric matter, and a vibratory ſtruggle betwixt it and the air; which again produces the appearances of fire and light, for the reaſons already given.

100 Proofs of the vibratory motion of the electric fluid.

That this kind of vibratory motion or ſtruggle between the electric fluid and air always takes place when the latter is ſet in motion, ſeems evident from the ſenſation which is felt when a ſtrongly excited electric is brought near any part of the human body. This is ſuch as would be occaſioned by a ſpider's web drawn lightly along the ſkin, or rather by a multitude of ſmall inſects crawling upon the body. It is, however, more clearly proved by an experiment made by Dr Prieſtley. He was deſirous to know whether the electric fluid was concerned in the freezing of water or not. For this purpoſe, he expoſed two diſhes of water to the open air in the time of a ſevere froſt. One of them he kept pretty ſtrongly electrified; but could obſerve no difference in the time either when it began to freeze, which was in about three minutes, or in the thickneſs of the ice, when both had been frozen for ſome time. Happening to look out at the window through which he had put the diſhes, he obſerved on each ſide of the electrified wire the ſame dancing vapour which is ſeen near the ſurface of the earth in a hot day, or at any time near a body ſtrongly heated.

101 When an exhauſted cylinder cannot be excited;

If the glaſs cylinder which we want to excite is exhauſted of air, the electric matter, inſtead of flying off into the air, runs directly through the glaſs; and, meeting with ſome reſiſtance from the *vacuum* as it is called, a weak light is produced in the inſide, but no ſigns of electricity are perceived on the outſide of the glaſs. The ſame thing happens by giving the cylinder or tube a metallic coating. The fluid collected from the rubber runs directly through the glaſs, and along the ſurface of the metallic coating, which keeps off the preſſure of the air contained in the glaſs. If an electric lining is uſed, and the glaſs is exhauſted of air, the motion of the fluid becomes viſible through both, and the whole is tranſparent, as already obſerved. If the cylinder is lined with an electric ſubſtance, and the air is not exhauſted, the electricity on the outſide is often conſiderably increaſed; but the reaſon of this is not evident. Moſt probably it is owing to the different kind of electricity acquired by the inſide lining; for electricity of any kind always produces its oppoſite at a ſmall diſtance, the reaſon of which ſhall be afterwards given.

10 Nor on filled w condenſ air.

If the air within the cylinder is condenſed, the electrical appearances on the outſide are leſſened in proportion. The reaſon of this ſeems to be, that though it is neceſſary that the fluid ſhould not go through the ſubſtance of the glaſs very eaſily, yet it is requiſite that its paſſage ſhould not be totally obſtructed; and therefore the electric experiments ſucceed beſt when the air within the glaſs is a little rarefied. We muſt alſo conſider, that when an additional quantity of air is forced into the cylinder, an equal bulk of electric matter is forced out. The reſt of the matter, therefore, which is contained all round the glaſs, preſſes violently into its pores; but this preſſure, being directly oppoſite to what happens when the glaſs is excited, muſt of conſequence hinder the excitation. If the glaſs is now made very hot, the preſſure of the atmoſphere is kept off, and the paſſage of the electric fluid through the glaſs and condenſed air is rendered eaſier, and therefore the electric appearances on the outſide return.

On the ſame principles may we explain the excitation of a ſolid ſtick of glaſs, ſealing-wax, or ſulphur. Though theſe have no air within them, yet they have a very conſiderable quantity of electric matter, which reſiſts an expulſion from its place: and therefore, tho' it may yield a little when the rubber is applied to the outſide, yet it will inſtantly throw off into the atmoſphere what the rubber has left on the ſurface; becauſe the reſiſtance is leaſt towards that place, as ſoon as the electric has come out from under the rubber. Hence alſo we ſee the reaſon why no ſigns of electricity are obſerved on glaſs to which the rubber is immediately applied; namely, becauſe the preſſure being equally great all round, no part of the electric fluid can be thrown off into the atmoſphere, in order to ſet the reſt in motion.

The only thing neceſſary to be added in confirmation of this theory of excitation is, that electric ſubſtances of the ſame kind cannot be excited by rubbing them againſt one another. Thus glaſs cannot be excited by rubbing it againſt glaſs, &c. Mr Wilcke obſerved, that when two pieces of glaſs were rubbed upon each other in the dark, a very vivid light appeared upon them; which, however, threw out no rays, but adhered to the place where it was excited. It was attended with a ſtrong phoſphoreal ſmell, but no attraction or repulſion. From this experiment he inferred, that friction alone would not excite electricity; but that to produce this effect, the bodies rubbed together muſt be of different natures with reſpect to their attracting the electric fluid.

## § 7. *Of Poſitive and Negative Electricity.*

FROM what hath been already advanced, it will pretty plainly appear, that to increaſe the quantity of electric fluid in any body is a thing impoſſible, unleſs we alſo augment the ſize of the body. All the fine pores of every terreſtrial fluid are exceedingly full, and unleſs we ſeparate the minuteſt particles of the body farther from one another than they are naturally, we cannot introduce more of the electric fluid into it than there was before. This fluid, we have already ſeen, is not, like the air, endued with a repulſive force between its particles; and therefore it muſt be incompreſſible. If it is incompreſſible, all the phenomena attending it muſt be owing to its various motions, and the ſeeming accumulations of it muſt be owing only to its more briſk action in ſome places than in others. But before a complete ſolution of the phenomena of poſitive and negative electricity can be given, it is neceſſary to ſhow that theſe are not ſo eſſentially diſtinct and oppoſite as they have been thought to be, but may be converted into each other in ſuch caſes as we cannot poſſibly ſuppoſe either an addition or ſubtraction of the electric fluid.

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This poſition, however oppoſite to the common opinions on the ſubject, may be proved by the following experiments. 1. Let a coated phial be ſet upon an inſulating ſtand, and let its knob be touched by the knob of another phial negatively electrified. A ſmall ſpark will be obſerved between them, and both ſides of the inſulated phial will inſtantly be electrified negatively. Now, though we may ſuppoſe the one ſide of the phial which is touched by the negatively electrified one to loſe part of its fire, yet this cannot be the caſe with the other, becauſe there is nothing to take it away, and therefore it ought to appear in its natural ſtate. 2. Let a phial, having a pith-ball electrometer faſtened to its outſide coating, be ſlightly charged poſitively, and then ſet upon an inſulating ſtand. The outſide is then negatively electrified, or, according to Dr Franklin's theory, has too little electric matter in it. The pith-balls, however, will touch each other, or ſeparate but in a very ſmall degree: but let the knob of another bottle, which hath received a ſtrong charge of poſitive electricity, be brought near to the knob of the firſt, and the pith-balls on the outſide will diverge with poſitive electricity. Now, it is impoſſible that any ſubſtance can have both too much and too little electric matter at the ſame inſtant: yet we ſee that negative electricity may thus inſtantaneouſly be converted into the poſitive kind, in circumſtances where no addition of fire to the outſide can be ſuppoſed. 3. Let the ſame phial, with the pith-balls affixed to its outſide coating, be ſlightly charged negatively, and then inſulated. The outſide is now electrified poſitively, or, according to Dr Franklin's hypotheſis, has too great a quantity of electric fluid. Nevertheleſs, upon bringing the knob of a phial ſtrongly electrified negatively to that of the inſulated one, the pith-balls will inſtantly diverge with *negative* electricity. 4. Let a phial receive as full a charge of poſitive electricity as it can contain, and then inſulate it. Charge another very highly with negative electricity. Bring the knob of the negative bottle near that of the poſitive one, and a thread will play briſkly between them. But when the knobs touch each other, the thread after being attracted will be repelled by both. The negative electricity is ſomehow or other ſuperinduced upon the poſitive; and, for a few moments after the bottles are ſeparated, both will ſeem to be electrified negatively. But if the finger is brought near the knob of that bottle on which the negative electricity was ſuperinduced, it will inſtantly be diſſipated, a ſmall ſpark ſtrikes the finger, and the bottle appears poſitively charged as before.

From theſe metamorphoſes of poſitive into negative, or negative into poſitive, electricity, it ſeems proven in the moſt deciſive manner, that poſitive electricity doth not conſiſt in an *accumulation*, nor the negative kind in a *deficiency*, of the electric fluid. We are obliged, therefore, to adopt the only probable ſuppoſition, namely, that both of them ariſe entirely from the different directions into which the fluid is thrown in different circumſtances; and of conſequence, the only method of giving an intelligible explanation of poſitive and negative electricity is by conſidering the different direction of the fluid in each.

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Method of
determining the direction of
the fluid.

A great variety of methods have been contrived to aſcertain the direction of the electric fluid, but all of them ſeem uncertain except that which is drawn from the appearance of electric light. The luminous matter appearing on a point negatively electrified is very ſmall, reſembling a globule; it makes little noiſe, and has a kind of hiſſing ſound. The poſitive electricity, on the other hand, appears in a diverging luminous ſtream, which darts a conſiderable way into the air, with a crackling noiſe. Now, it is certain, that in whatever caſe the electric fluid darts from the point into the air, in that caſe it muſt be the moſt reſiſted by it; and this is evident in the poſitive electricity. In this, the rays evidently *diverge* from the points. We may, indeed, ſuppoſe them to be *converging* from many points in the ſurrounding air towards the metallic point. But why ſhould we imagine that a viſible ray would break out from one place of the atmoſphere more than another? The air, we know, reſiſts the motion of the electric fluid, and it certainly muſt reſiſt it equally. Of conſequence, when this fluid is coming from the air towards a pointed conductor, it muſt percolate ſlowly and inviſibly through the air on all ſides equally, till it comes ſo near that it is able to break through the intermediate ſpace; and as this will likewiſe be equal, or nearly ſo, all round, the negative electricity muſt appear like a ſteady luminous globule on the point, not lengthening or ſhortening by flaſhes as the poſitive kind does. Electricians have therefore determined with a great deal of reaſon, that when a point is electrified poſitively the matter flows out from it.

It is to be remarked, however, that in moſt caſes, if not in all, a body cannot be electrified negatively till it has firſt become poſitively electrified; and it is in the act of diſcharging its poſitive electricity that it becomes negative. Thus, ſuppoſe a coated phial to be ſet upon an inſulated ſtand, and its knob is approached by that of another bottle charged poſitively: a ſmall ſpark is obſerved between them, and both ſides of the inſulated bottle are electrified poſitively; but as ſoon as the finger is brought near to the outſide, the poſitive electricity is diſcharged by a ſpark, and a negative one appears. But from what hath been already advanced,

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it is evident, that poſitive electricity is when the fluid hath a tendency to leave any body, and the negative electricity when it hath the ſame tendency to enter it. Therefore, as the electric fluid is ſubject to mechanical laws as well as other fluids, it muſt follow, that theſe tendencies are produced and kept up by the motions excited originally in the air, and electric fluid in the air, ſurrounding theſe bodies. If this principle is kept in view, it will lead us to an eaſy explanation of many electrical phenomena, for which no ſatisfactory reaſon hath hitherto been given.

### § 8. *Of Electric Attraction and Repulſion.*

IT hath now been ſhown, that, in bodies electrified poſitively, there is a flux of electric matter from their ſurface all round; that is, the fluid contained in their pores puſhes out on every ſide, and communicates a ſimilar motion to the electric fluid contained in the adjacent atmoſphere. This muſt of neceſſity very ſoon exhauſt the body of its electric matter altogether, if it was not inſtantaneouſly ſupplied after every emiſſion. But this ſupply is immediately procured from the ſurrounding atmoſphere. The quantity ſent off is inſtantly returned from the air, and the vibratory motion or ſtruggle between the air and electric fluid, which hath been often mentioned, immediately takes place. The poſitive electricity therefore conſiſts in a vibratory motion in the air and electric fluid; and the force of this vibration is directed outwards from the electrified body. In bodies negatively electrified, the fluid contained in the neighbouring atmoſphere is directed towards the body ſo electrified. But it is certain, that this motion inwards cannot be continued unleſs there is alſo a motion of the fluid outwards from the body. In this caſe alſo there is a vibratory motion, but the force of it is directed inwards, and as the ſource of it lies not in the body, but in the ſurrounding atmoſphere, it manifeſts itſelf ſomewhat leſs vigorouſly.

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Why electric appearances continue ſo long.

The reaſon why theſe motions are continued for ſuch a length of time as we ſee they are, is, the extreme mobility of the electric fluid. It doth not indeed appear from any experiments, that this fluid hath the leaſt friction among its parts. A motion once induced into it muſt therefore continue for ever, until it is counteracted by ſome other motion of the ſame fluid. Hence, when a vibratory motion is once introduced among the particles of the electric fluid contained in any ſubſtance, that motion will be kept up by the ſurrounding fluid, let the body be removed to what place we pleaſe. There is no occaſion indeed for ſuppoſing any thing like an electric atmoſphere round the electrified body. The caſe is exactly the ſame as with a burning body. Let a candle be carried to what place we will, it will ſtill burn; but it would be abſurd to ſay, that the fire ſurrounded it like an atmoſphere, as we know the fire is kept up by the air only, which is changed every moment. In like manner, the poſitive and negative electricities, which are two different motions of the electric fluid, are kept up by the air and electric matter contained in it; and, wherever the electrified body is carried, theſe fluids are equally capable of continuing them.

The phenomena of attraction and repulſion are now eaſily explained. Let us ſuppoſe a body poſitively electrified ſuſpended by a ſmall thread, at a diſtance from any other. The vibration above-mentioned, in which poſitive electricity conſiſts, being kept up by the equable preſſure on all ſides, the body is neither moved to one ſide nor another. But when a negatively electrified body is brought near, the force of the vibration being directed outwards in the one, and inwards in the other, the preſſure of the fluid in the intermediate ſpace between them is greatly leſſened; and of conſequence the preſſure on the other ſides drives them together, and they are ſaid to *attract* each other. If another body, electrified alſo poſitively, is brought near to the firſt, the force of the vibrations are directly oppoſed to one another, and therefore the bodies recede from each other, and are ſaid to *repel* one another. The caſe is the ſame with two bodies negatively electrified: for there the electricity, as far as it extends round the bodies, conſiſts of a vibratory motion of the electric fluid; and the vibrations being directed towards both the bodies, as towards two different centres, muſt neceſſarily cauſe them recede from each other; becauſe, if they remained in contact, the vibratory motions would interfere with and deſtroy one another.

When a ſmall body is brought within the ſphere of another's electricity, the equable preſſure of that vibratory or electrical ſphere is ſomewhat leſſened upon the ſide near which the ſecond body is brought; and therefore it is immediately impelled towards the firſt by the action of the ſurrounding fluid, in order to keep up the equilibrium. As ſoon as it arrives there, the vibrations of the fluid around the firſt body being communicated to that within the pores of the ſecond, it immediately acquires a ſphere of electricity as well as the firſt, and is conſequently repelled. The repulſion continues till the vibration ceaſes either by the action of the air, or by the body coming in contact with another much larger than itſelf; in which caſe the electricity is ſaid to be *diſcharged*. If, after this diſcharge of electricity, the ſecond body is ſtill within the electric ſphere of the firſt, it will immediately be attracted, and very ſoon after repelled, and ſo on alternately till the electricity of the former totally ceaſes.

### § 9. *Of the Diſcharge of Electricity by Sparks upon blunt Conductors, and ſilently by pointed Ones.*

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THE manner in which this is accompliſhed will beſt appear from conſidering the nature of what is commonly called *electricity*. This cannot appear but in an electric ſubſtance; and the ſubſtance in which it doth appear is the air. The prime conductor of an electrical machine diſcovers no other properties in itſelf, when electrified, than it had before. The metal is equally hard, ſhining, and impenetrable. The electricity, or properties of attracting, repelling, &c are all lodged in the air; and if the conductor is placed *in vacuo*, they inſtantly ceaſe. It hath already been ſhown, that the electric matter runs over the ſurface of conducting ſubſtances in great quantities, like a ſtream of water running from one place to another. In this manner it will not paſs over the ſurface of electrics. It enters their ſubſtance, and paſſes through it with a vibratory motion. This vibratory motion always ſhows a reſiſtance; nor is it in any caſe poſſible to induce a vibration without firſt impreſſing a motion in one direction, and then reſiſting it by a contrary motion

Round the ſurface of an electrified body ſuſpended in the air, therefore, there is always an equable preſſure, by which the emiſſion of the electric fluid is every moment checked, and by which its vibrations are occaſioned. When a metallic ſubſtance is brought near the electrified body, the fluid has an opportunity of making its eſcape, provided it could get at the metal, becauſe it could run along its ſurface. The preſſure of the air is alſo leſſened on that ſide which the conducting ſubſtance approaches. The whole effort of the electric matter contained in the vibratory ſphere is exerted againſt that ſingle place, becauſe the reſiſtance is leaſt. If the body has a broad ſurface, however, the diſproportion between theſe reſiſtances is not ſo great as when its ſurface is leſs. Let us ſuppoſe, for inſtance, that the ſurface of the conducting ſubſtance contains an inch ſquare, and that the whole ſurface of the electrified ſphere contains only ſix ſquare inches. When the conducting ſubſtance approaches, all the preſſure is directed towards that place; and the effort made by the electric matter to eſcape there, is five times as great as what it is any where elſe. Nevertheleſs, though it has a vibratory motion in the ſubſtance of the air, it cannot have a progreſſive motion through it without violently diſplacing its parts; and an inch ſquare of air makes a conſiderable reſiſtance. At laſt, however, if this reſiſtance is every moment made leſs by approaching the conducting ſubſtance nearer to the electrified body, the electric matter breaks through the thin plate of air, ſtrikes the conductor, and runs along it. The ſpark is produced by the reſiſtance it meets with from the air. But if, inſtead of a body with a broad ſurface, we preſent the point of a needle, whoſe ſurface is perhaps not above the ten-thouſandth part of a ſquare inch, the effort of the electric matter to diſcharge itſelf there will be 60,000 times greater than at any other place, becauſe the whole effort of the ſix ſquare inches, of which we ſuppoſe the ſurface of the electric ſphere to conſiſt, is exerted againſt that ſingle point. The air alſo reſiſts, as in the former caſe; but it can reſiſt only in proportion to the extent of its ſurface which covers the conducting body; and this, being only the ten-thouſandth part of a ſquare inch, muſt be exceedingly little. As ſoon therefore as a needle, or any other fine pointed body, is preſented to an electrified ſubſtance, the electric matter is urged thither with great velocity; and as it hath an opportunity of running along the needle, its vibrations quickly ceaſe, and the electricity is ſaid to be *drawn off.*—This drawing off, however, does not extend all round the electrified body, if means are uſed to keep up the electricity perpetually. Thus, if, on the end of the prime conductor, there are faſtened a number of fine threads, hairs, &c. when the cylinder is turned, the threads on the end will diverge, and ſpread out like as many rays proceeding from a centre. If a point is preſented on one ſide of the conductor, though at a conſiderable diſtance, the threads on one ſide will loſe their divergency and hang down, but thoſe on the other ſide will continue to diverge. The reaſon of this is, the difficulty with which the electric fluid gets through the atmoſphere, even where the reſiſtance of it is made as little as poſſible; and hence alſo we may ſee why more conductors than one may be neceſſary for the ſafety of large buildings. See LIGHTNING.

### § 10. *Why Poſitive Electricity hath a Tendency to induce the Negative Kind on any Body kept within its Sphere of Action, and why Negative Electricity produces the Poſitive Kind in ſimilar Circumſtances.*

THIS is one of the electrical phenomena moſt difficult to be ſolved; and indeed ſeems totally inſolvable, unleſs we give up the idea of *accumulation* and *deficiency* of the electric fluid in different bodies. On Dr Franklin's principles, no ſolution hath been attempted. Mr Cavallo places this among the *properties* of electricity for which he doth not pretend to account, but gives as the *cauſes* of other phenomena. It is indeed certain, that if a body hath already *too much* electricity or any thing elſe, it cannot be continually taking from thoſe around it; and if it hath *too little*, it cannot be continually giving them. By attending to the principles above laid down, however, this phenomenon admits of an eaſy ſolution. As poſitive electricity conſiſts in a vibratory motion of the electric matter in the pores of any body, and to ſome diſtance through the air, while at the ſame time the force is directed outwards from the body, it is plain, that if any other body is brought within this ſphere, the direction of the vibration is changed; for what is *outwards* from the one is *inwards* to the other. But a vibratory motion, the force of which is directed *inwards*, is what conſtitutes negative electricity; and, therefore, no ſooner is any body placed at ſome diſtance from one poſitively electrified, than it immediately becomes negatively ſo. The ſame reaſon may be given why negative electricity produces the poſitive kind on a body placed near it. In the negative kind, the force of the vibration is directed inwards. If another body is brought near, the vibration which is *inwards* to the firſt muſt be *outwards* from the ſecond, which thus becomes poſitively electrified. The only difficulty here, is to account for this motion, which is only inward or outward to one ſide of the body brought near the electrified one, being ſo ſuddenly propagated all round. This, however, muſt eaſily be ſeen to ariſe from the extreme ſubtility of the electric fluid, and its effort to keep up an equilibrium in all parts, which it will never ſuffer to be broken. When this fluid puſhes inward to one ſide of a body, the fluid contained in that body would immediately yield, and allow a free paſſage to what came after, if its yielding was not obſtructed by ſomething on the other ſide. This obſtruction ariſes from the air, which cannot admit a progreſſive motion of electric matter through it. No ſooner, therefore, is a puſh made againſt one ſide than a contrary one is made againſt the other; and thus the body inſtantly becomes electrified all round.

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Why a motion of the electric fluid on one ſide is ſuddenly propagated round a body.

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Zones of poſitive and negative electricity accounted for.

On theſe principles, alſo, may we account for the zones of poſitive and negative electricity which are to be found on the ſurface of glaſs tubes *; and eſpecially in electrified air. When the prime conductor of a machine is ſtrongly electrified poſitively, it is throwing out the fluid from it in all directions. The air cannot receive this fluid without throwing out that which it alſo contains; and this ſhows, that ſimple electrification can neither increaſe nor diminiſh the denſity of the air, which is alſo vouched by numberleſs experiments. But if the air throws out its electric fluid in all directions, it muſt throw part of it back upon the conductor;

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* See n° 68,

tor, and conſequently obſtruct its operations. This likewiſe is found to be the caſe; for it is impoſſible to make an electric machine act long with the ſame degree of ſtrength, owing to the electricity communicated from it to the air. But if the conductor and air are thus reciprocally throwing the electric matter back upon one another, it is impoſſible but another zone of air which lies at a greater diſtance muſt be continually receiving it, or be electrified negatively. But this cannot receive, without alſo emitting the fluid it contains; which, therefore, will be thrown upon another zone behind it, and partly back upon the firſt. The original force of the fluid being now ſpread over a large ſpace. will conſequently be diminiſhed; and the ſucceeding zone will be electrified weakly, though poſitively. In like manner, a ſucceeding zone muſt yield, and receive the fluid from this; which will conſequently be electrified negatively, though weaker than the former: and thus zones of poſitive and negative electricity will gradually ſucceed each other in the air, till no traces of either are to be found.—In theſe zones, it muſt be remembered, that there is a centre peculiar to each, and from this centre the vibrations proceed either inward or outward. Thus, when the machine is firſt ſet in motion, a vibration is propagated from it as from a centre to ſome diſtance in the air, and the air is at firſt negatively electrified. But as this vibratory motion cannot be extended far in one direction. vibrations begin to be propagated in all directions from another centre at ſome diſtance. The conductor becomes then leſs poſitively electrified than before; however, by means of the machine, its electricity is ſtill kept up, though weaker; but a zone of air beyond the firſt, where the reſiſtance is much leſs, becomes negatively electrified. This again cannot continue long till vibrations outwards ariſe from another centre, and ſo on. It is ſcarce needful to add here, that the longer the electrification is continued, and the ſtronger it is, the broader theſe zones muſt be.

### § 11. *Of the Leyden Phial.*

The phenomena of the Leyden phial are eaſily explained from what hath been already advanced. Glaſs and other electric ſubſtances are ſo conſtituted, that they can tranſmit the vibratory motions of the electric matter, though they cannot admit of any conſiderable progreſſive one. Conducting ſubſtances, on the other hand, admit of a progreſſive motion, but not ſo eaſily of a vibratory one. When the electric fluid is procured from the earth by an electric machine, if the conductor had a communication with the earth, all the matter collected by the cylinder would run along the conductor into the earth, and not a ſpark or other appearance of electricity would be procured in the air. But when the conductor is inſulated, the matter is forced to go off into the air, and there produces the vibratory motions already mentioned. If a pane of glaſs which has no metallic coating touches the conductor, though it is permeable by the vibratory motion of the fluid, yet a conſiderable reſiſtance is made, and the fluid cannot eaſily diffuſe itſelf over its ſurface. Nevertheleſs, it will ſoon ſhow ſigns of having received electricity, that is of having the fluid within its pores thrown into a vibratory motion. This motion is directed outwards, from the middle of the ſubſtance of the glaſs, to the ſurface, and a conſiderable way beyond it on both ſides. Both ſides of the glaſs are then poſitively electrified. If a conducting ſubſtance touches one of the ſides of the glaſs, the vibrations on that ſide are deſtroyed; becauſe the fluid which occaſioned them yields to the reſiſtance it met with, and runs along the conductor into the earth. But no ſooner is this done, than the power which reſiſted the vibration outward from the glaſs having got the better in the manner juſt now explained, a new vibration is produced by that reſiſting power; and the force of this vibration is directed towards the ſide from whence the electricity was drawn off, which therefore becomes electrified negatively. Thus may we underſtand how a pane of glaſs, or any other electric, may receive poſitive electricity on the one ſide and negative on the other. to as high a degree as we pleaſe. But there is found to be a limit to every charge of electricity we can give; and this limit is the reſiſtance of the air. A phial will contain double the charge in air doubly condenſed that it does in the common atmoſphere; and when once the vibration becomes too great to be borne, the poſitive ſide of the glaſs throws out pencils of light, and will receive no more electricity in that ſtate of the atmoſphere.

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Thus, in every charged phial, there is a violent impulſe or vibration of the fluid, *outward* from the poſitive, and *inward* to the negative, ſide. As long as theſe continue, the phial continues charged. As the electric fluid ſeems to be ſubject to no other natural power, but controls all its own actions only by moving in oppoſite directions, it is plain, that if a charged phial is carefully kept from any of thoſe means by which it is known to be diſcharged, it muſt keep its charge for a long time; and thus. by keeping phials within glaſs caſes, their charge will be retained for ſix or eight weeks, or perhaps a great deal longer. The only method of diſcharging a phial, is by making a communication between its coatings. The fluid preſſing out of the poſitive ſide. now yields to the preſſure of that from the negative ſide, and runs along the conductor. But no ſooner does it come near the negative ſide of the phial, than, meeting with more of the ſame kind, the current of which is directed the ſame way, both together break through the air with a violent flaſh and crack, and all appearances of electricity ceaſe. —In this, as in all other electrical experiments, it is eaſy to ſee, that the force, velocity, &c. of the fluid depends entirely on the preſſure of that which ſurrounds us. Nature hath appointed a certain conſtitution or modification of the electric fluid in all terreſtrial bodies, and likewiſe all round the earth. In our electrical experiments, we violate this conſtitution in ſome degree. When this violation is but ſmall. the powers of nature operate gently in repairing the diſorder we have introduced; but when any conſiderable deviation is occaſioned, the natural powers reſtore the original conſtitution with extreme violence.

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### § 12. *The Phenomena of the Electrophorus accounted for.*

The electrophorus is a machine repreſented Plate CLXXVII. fig. 74. It conſiſts of two plates, A and B, uſually of a circular form; though they may be made ſquare, or of the figure of a parallelogram, with more eaſe, and with equal advantage. At firſt the under plate was of ry

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of glaſs, covered over with ſealing-wax; but there is little occaſion for being particular either with regard to the ſubſtance of the lower plate, or the electric which is put upon it. A metallic plate, however, is perhaps preferable to a wooden one, though the latter will anſwer the purpoſe very well This plate is to be covered with ſome electric ſubſtance. Pure ſulphur anſwers very near as well as the dearer electrics, ſealing-wax, gum-lac, &c.; but it hath this bad quality, that, by rubbing it, ſome exceeding ſubtile ſteams are produced, which infect the perſon's clothes, and even his whole body, with a very diſagreeable ſmell, and will change ſilver in his pocket to a blackiſh colour.—The upper plate of the electrophorus is a braſs plate, or a board or piece of paſteboard covered with tin-foil or gilt paper. nearly of the ſame ſize with the electric plate though it will not be the worſe that it is ſomewhat larger. It is furniſhed with a glaſs handle (I), which ought to be ſcrewed into the centre. The manner of uſing this machine is as follows. Firſt, the plate B is excited by rubbing its coated ſide with a piece of new white flannel, or a piece of hare's ſkin. Even a common hard ſhoe-bruſh, having the hair a little greaſed, will excite ſulphur extremely well. When this plate is excited as much as poſſible, it is ſet upon the table with the electric ſide uppermoſt Secondly, the metal plate is laid upon the excited electric, as repreſented in the figure. Thirdly, the metal plate is touched with the finger or any other conductor, which, on touching the plate, receives a ſpark from it. Laſtly, the metal plate A, being held by the extremity of its glaſs handle (I), is ſeparated from the electric plate; and, after it is elevated above that plate, it will be found ſtrongly electrified with an electricity contrary to that of the electric plate; in which caſe, it will give a very ſtrong ſpark to any conductor brought near it. By ſetting the metal upon the electric plate, touching it with the finger, and ſeparating it ſucceſſively, a great number of ſparks may be obtained apparently of the ſame ſtrength, and that without exciting again the electric plate. If theſe ſparks are repeatedly given to the knob of a coated phial, it will preſently become charged.

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" As to the continuance of the virtue of this electric plate (ſays Mr Cavallo), when once excited, without repeating the excitation, I think there is not the leaſt foundation for believing it perpetual, as ſome gentlemen have ſuppoſed; it being nothing more than an excited electric, it muſt gradually loſe its power by imparting continually ſome of its electricity to the air, or other ſubſtances contiguous to it. Indeed its electricity, although it could never be proved to be perpetual by experiments, laſts a very long time, it having been obſerved to be pretty ſtrong ſeveral days, and even weeks, after excitation. The great duration of the electricity of this plate, I think, depends upon two cauſes: firſt, becauſe it does not loſe any electricity by the operation of putting the metal plate upon it, &c. and, ſecondly, becauſe of its flat figure, which expoſes it to a leſs quantity of air, in compariſon with a ſtick of ſealing-wax, or the like, which, being cylindrical, expoſes its ſurface to a greater quantity of air, which is continually robbing the excited electrics of their virtue.

" The firſt experiments that I made, relative to this machine, were with a view to diſcover which ſubſtance would anſwer beſt for coating the glaſs plate, in order to produce the greateſt effect. I tried ſeveral ſubſtances either ſimple or mixed; and at laſt I obſerved, that the ſtrongeſt in power, as well as the eaſieſt, I could conſtruct, were thoſe made with the ſecond ſort of ſealing-wax, ſpread upon a thick plate of glaſs. A plate that I made after this manner, and no more than ſix inches in diameter, when once excited, could charge a coated phial ſeveral times ſucceſſively, ſo ſtrongly as to pierce a hole through a card with the diſcharge. Sometimes the metal plate, when ſeparated from it, was ſo ſtrongly electrified, that it darted ſtrong flaſhes to the table upon which the electric plate was laid, and even into the air, beſides cauſing the ſenſation of the ſpider's web upon the face brought near it, like an electric ſtrongly excited. The power of ſome of my plates is ſo ſtrong, that ſometimes the electric plate adheres to the metal when this is lifted up, nor will they ſeparate even if the metal plate is touched with the finger or other conductor. It is remarkable, that ſometimes they will not act well at firſt, but they may be rendered very good by ſcraping with the edge of a knife the ſhining or gloſſy ſurface of the wax. This ſeems analogous to the well-known property of glaſs, which is, that new cylinders or globes, made for electrical purpoſes, are often very bad electrics at firſt; but that they improve by being worked, *i. e.* by having their ſurface a little worn. Paper alſo has this property.

114 Experiments with the electrophorus.

" If, after having excited the ſealing-wax, I lay the plate with the wax upon the table, and the glaſs uppermoſt, *i. e.* contrary to the common method; then, on making the uſual experiments of putting the metal plate on it, and taking the ſpark, &c. I obſerve it to be attended with the contrary electricity: that is, if I lay the metal plate upon the electric one, and, while in that ſituation, touch it with an inſulated body, that body acquires the poſitive electricity; and the metallic, removed from the electric plate, appears to be negative; whereas it would become poſitive, if laid upon the excited wax. This experiment, I find, anſwers in the ſame manner if an electric plate is uſed which has the ſealing-wax coating on both ſides, or one which has no glaſs plate.

" If the braſs plate, after being ſeparated from, be preſented with the edge toward the wax, lightly touching it, and thus be drawn over its ſurface, I find that the electricity of the metal is abſorbed by the ſealing-wax, and thus the electric plate loſes part of its power; and if this operation is repeated five or ſix times, the electric plate loſes its power entirely, ſo that a new excitation is neceſſary in order to revive it.

" If, inſtead of laying the electric plate upon the table, it is placed upon an electric ſtand, ſo as to be accurately inſulated, then the metal plate ſet on it acquires ſo little electricity, that it can only be diſcovered with an electrometer; which ſhows, that the electricity of this plate will not be conſpicuous on one ſide of it, if the oppoſite ſide is not at liberty either to part with or acquire more of the electric fluid. In conſequence of this experiment, and in order to aſcertain how the oppoſite ſides of the electric plate would be affected in different circumſtances, I made the following experiments.

" Upon an electric ſtand E, (Plate CLXXVII. fig. 74.)

I placed a circular tin-plate, nearly ſix inches in diameter, which by a ſlender wire H communicated with an electrometer of pith-balls G, which was alſo inſulated upon the electric ſtand F I then placed the excited electric plate D of ſix inches and a quarter in diameter, upon the tin-plate, with the wax uppermoſt; and on removing my hand from it, the electrometer G, which communicated with the tin-plate, *i. e.* with the under ſide of the electric plate, immediately opened with negative electricity. If, by touching the electrometer, I took that electricity off, the electrometer did not afterwards diverge. But if now, or when the electrometer diverged, I preſented my hand open, or any other uninſulated conductor, at the diſtance of about one or two inches, over the electric plate, without touching it, then the pith-balls diverged; or, if they diverged before, came together, and immediately diverged again with poſitive electricity:—I removed the hand, and the balls came together;—approached the hand, and they diverged: and ſo on.

"If, while the pith-balls diverged with negative electricity, I laid the metal plate, holding it by the extremity K of its glaſs handle, upon the wax, the balls came, for a little time, towards one another, but ſoon opened again with the ſame, *i. e.* negative electricity.

"If, whilſt the metallic reſted upon the electric plate, I touched the former, the electrometer immediately diverged with poſitive electricity; which if, by touching the electrometer, I took off, the electrometer continued without divergence.—I touched the metal plate again, and the electrometer opened again; and ſo on for a conſiderable number of times, until the metal plate had acquired its full charge. On taking now the metal plate up, the electrometer G inſtantly diverged with ſtrong negative electricity.

"I repeated the above-deſcribed experiments, with this only difference in the diſpoſition of the apparatus, *i. e.* I laid the electric plate D with the excited ſealing-wax upon the circular tin-plate, and the glaſs uppermoſt; and the difference in their reſult was, that where the electricity had been poſitive in the former diſpoſition of the apparatus, it now became negative, and *vice verſa*; except that, when I firſt laid the electric plate upon the tin, the electrometer G diverged with negative electricity, as well in this as in the other diſpoſition of the apparatus.

"I repeated all the above experiments with an electric plate, which, beſides the ſealing-wax coating on one ſide, had a ſtrong coat of varniſh on the other ſide, and their reſult was ſimilar to that of thoſe made with the above-deſcribed plate."

115 Miſtakes in Mr Cavallo's obſervations.

This is Mr Cavallo's account of the electrophorus; but there is one part of it in which he muſt certainly be miſtaken. He tells us, that "if inſtead of laying the electric plate upon the table, it is ſet upon an electric ſtand, ſo as to be accurately inſulated, then the metal plate ſet on it acquires ſo little electricity, that it can only be diſcovered by an electrometer." In what manner this gentleman came to miſtake a plain fact ſo egregiouſly, is not eaſy to determine; but it is certain, than an electrophorus, inſtead of having its virtue impaired by being inſulated, has it greatly increaſed, at leaſt the ſphere of its activity is greatly enlarged. When lying on the table, if the upper plate is put upon it without being touched with the finger, it will not ſhow much ſign of electricity. But as ſoon as it is put on the electric ſtand, both the upper and under ſide appear ſtrongly negative. A thread will be attracted at the diſtance of eight or ten inches. If both the upper and under ſide are touched at the ſame time, a ſtrong ſpark will be obtained from both, but always of the ſame kind of electricity, namely, the negative kind. If the upper plate is now lifted up, a ſtrong ſpark of poſitive electricity will be obtained from it; and on putting it down again, two ſparks of negative electricity will be produced.

116 Singular appearan on inſulating an electroph rus.

The ſingularity of this experiment is, that it produces always double the quantity of negative electricity that it doth of the poſitive kind; which cannot be done by any other method yet known Another very ſurpriſing circumſtance is, that when the electrophorus remains in its inſulated ſituation, you need not always touch the upper and under ſide of the plates at once, in order to procure poſitive electricity from the upper plate: It is ſufficient to touch both ſides only once. On lifting up the upper plate, a ſpark of poſitive electricity is obtained as already mentioned. On putting it down again, a ſpark of the negative kind is obtained from the upper plate, even though you do not touch the lower one. On lifting up the upper plate, a ſpark of poſitive electricity is obtained, but weaker than it would have been had both ſides been touched at once. Putting down the upper plate again without touching both, a ſtill weaker ſpark firſt of negative and then of poſitite electricity will be obtained from the upper one. Thus the ſparks will go on continually diminiſhing, to the number perhaps of two or three hundred. But at laſt, when the electricity of the whole machine ſeems to be totally loſt, if both ſides are touched at once, it will inſtantly be reſtored to its full ſtrength, and the double ſpark of negative, with the ſingle one of poſitive electricity, will be obtained without intermiſſion as before.

11 General reaſon of all the ph nomena.

To account for all theſe phenomena very particularly, is perhaps impoſſible, without a greater degree of knowledge concerning the internal fabric of bodies than we have acceſs to attain. In general, however, it is evident, that the phenomena of the electrophorus ariſe from the diſpoſition that the electric matter hath to keep up an equilibrium within itſelf throughout every part of the univerſe. In conſequence of this, no motion of the electric matter can be produced upon the one ſide of a body, but it muſt immediately be balanced by a correſponding one on the oppoſite ſide; and in proportion to the ſtrength of the one, ſo will the ſtrength of the other be. When the under plate of the electrophorus is excited, the negative electricity or vibratory action of the electric matter towards the excited ſide, is produced; and the moment that ſuch an action is produced on one ſide, it is reſiſted by a ſimilar one on the oppoſite ſide, and thus the electrophorus becomes negatively electrified on both ſides. As long as the under part of the machine communicates with the earth, the vibratory motion is impeded by the progreſſive one towards the earth. This makes the reſiſtance on the under ſide leſs, and therefore the vibratory motion on the upper part extends but a ſmall way. When the plate is inſulated, the electric matter has not an opportunity of eſcaping to the earth as before, becauſe it is ſtrongly reſiſted by the air; a vibration

bration therefore takes place on both ſides, and extends to a great diſtance from the plate. When the upper plate is ſet upon the electrophorus, the ſame kind of electricity, *viz.* the negative kind, is communicated to it. When both ſides are touched with the finger, or with any other conducting ſubſtance, both electricities are ſuddenly taken off, becauſe the electric matter running along the conducting ſubſtance on both ſides, puts an end to the vibratory motion in the air, which conſtitutes the very eſſence of what we call *electricity*. There is now a quiet and equal balance of the electric matter on both ſides, and therefore no ſigns of electricity are ſhown. But as ſoon as the upper plate is taken off, this balance is deſtroyed. The fluid in the metal plate had not been able to penetrate the electric ſubſtance in ſuch a manner as to put a ſtop to the vibrations of what was within it. As ſoon then as the plate is taken off, the electricity or vibratory motion towards the electric breaks out at that ſide. But this motion *inwards* to the electric, which conſtitutes negative electricity, neceſſarily becomes *outward* from the plate; and as no motion of the fluid can be produced on one ſide of a body, but what is immediately communicated to the other, the upper plate becomes electrified poſitively, and the under one negatively on both ſides.

### SECT. VII. *Of the Method of uſing the Electrical Apparatus already deſcribed, with ſome practical Rules for performing Experiments with it to the beſt Advantage.*

Method of uſing the Electrical Apparatus, &c.

THE machines already deſcribed are calculated for exhibiting the phenomena of electricity in a very high degree; and in general the following effects may be expected from them.

1. On whirling the cylinder in contact with the rubber, without bringing any conducting body near the former, or inſulating the latter, we will perceive in the dark a ſtream of fire ſeemingly iſſuing from the place of contact between the rubber and cylinder, and adapting itſelf to the form of the cylinder ſo as to involve it in a blue flame mixed with bright ſparks; the whole making a very perceptible whizzing and ſnapping noiſe. If the finger is brought near the cylinder in this ſituation, the flame and ſparks will leave the cylinder and ſtrike it; and this phenomenon will continue as long as the globe is whirled round.

2. On applying the prime conductor, the light will in a great meaſure vaniſh, and be perceptible only upon the points preſented by it to the cylinder: but if the finger is now brought near the conductor, a very ſmart ſpark will ſtrike it, and that at a greater or ſmaller diſtance according to the ſtrength of the machine. This ſpark, when the electricity is not very ſtrong, appears like a ſtraight line of fire; but if the machine acts very powerfully, it will put on the appearance of zigzag lightning, throwing out other ſparks from the corners, and ſtrike with ſuch force as to give conſiderable pain to thoſe who receive it. Theſe ſparks in certain circumſtances will ſet fire to ſpirits, tinder, gunpowder, &c.

120 Method of drawing ſparks.

3. If inſtead of the hand or any part of the human body, we hold the knob of a coated phial near the conductor, a vaſt number of ſparks will appear between them, firſt with a loud ſnapping noiſe, but gradually diminiſhing until at laſt it ceaſes, and pencils of blue flame intermixed with ſmall ſparks will be thrown out by the phial; and if the latter is ſtill kept near the conductor, it will in a little time diſcharge itſelf with a violent flaſh and crack; after which, if the phial has not been broke by the diſcharge, the ſparks from the conductor will begin as before, and the ſame phenomena be repeated as long as the cylinder is turned, or till the phial breaks.

121 On applying the battery, &c.

4. On applying the battery, though the accumulation of electricity be much greater than in a ſingle phial, the ſigns of it are much leſs apparent; and ſparks will always paſs between the conductor and knob leading to the battery, by reaſon of the great evaporation from the latter into the air. But here, if one of the jars diſcharges itſelf, all the reſt are likewiſe diſcharged in the ſame moment, and ſome of them generally broken.

5. A thread or other light body ſuſpended near the conductor will be attracted at a conſiderable diſtance; and the force of attraction will be greater or leſs according to the power of the machine.

6. The electricity in all caſes will be poſitive if the rubber be not inſulated, and negative if it is ſo: and by Mr Nairne's contrivance of having a conductor connected with the inſulated rubber, and another with the cylinder, both kinds of electricity may be had with equal eaſe.

122 Effects of the great machine in Teyler's muſeum.

All theſe phenomena are the more remarkable in proportion to the power of the machine. That uſed in Teyler's muſeum is the ſtrongeſt of which we have yet heard; and its effects are as follow.

On preſenting a very ſharp ſteel point to the prime conductor, a luminous ſtream of about half an inch was perceived between them. On fixing the point to the conductor ſo as to project three inches from it, ſtreams of light were thrown out from the point ſix inches long when a ball of three inches in diameter was preſented, but only two inches in length on preſenting another point.

The ſenſation called the *ſpider's web* on the face of the byſtanders (B) is often felt at the diſtance of eight feet from the prime conductor. A thread ſix feet long was ſenſibly attracted at the diſtance of 30 from the prime conductor, and a pointed wire appeared luminous at the diſtance of 28 feet; a cork-ball electrometer diverged at the diſtance of 40 feet.

A ſingle ſpark from the conductor melted a conſiderable length of gold-leaf; gunpowder and other combuſtibles, incloſed in a paper cartridge, with a ſharp point in the middle, were fired; and when another conductor communicating with the earth was placed at the diſtance of 21, or ſometimes 24 inches

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(B) This is a kind of ſenſation always produced by ſtrong electricity, ſomething reſembling the creeping of inſects or the motion of a light body, ſuch as a ſpider's web, over the ſkin, as already mentioned. It ſeems to proceed from the attraction and electrification of the ſmall hairs with which the body is covered.

from the prime conductor of the machine, a ſtream of fire was perceived between them. This was crooked, and darting out many lateral bruſhes of a very large ſize, in the manner already mentioned. A Leyden phial, containing about one ſquare foot of coated ſurface, was fully charged by about half a turn of the winch ſo as to diſcharge itſelf: and by repeated trials it was found, that in one minute it diſcharged itſelf 76, 78, and frequently 80 times. Laſtly, it was found, that though the conductor, which received the ſparks from the prime one of the machine, communicated with the earth by a wire $\frac{1}{8}$ths of an inch in diameter, this wire would give ſmall ſparks to any conducting body brought near it, as if even this wire had not been ſufficient to conduct the quantity of electricity it received from the machine very readily to the earth.

Though theſe effects are not to be expected from our ordinary electrical machines, yet it is certain, that by taking proper care of them they will be found to act much more powerfully than if neglected. The following directions therefore will be found uſeful for ſuch as wiſh to make electrical experiments.

1. The firſt thing to be obſerved is, the preſervation and care of the inſtruments. The electrical machine, the coated jars, and in ſhort every part of the electrical apparatus, ſhould be kept clean, and as free as poſſible from duſt and moiſture.

2. When the weather is clear, and the air dry, eſpecially in clear and froſty weather, the electrical machine will always work well. But when the weather is very hot, the electrical machine is not ſo powerful; nor in damp weather, except it be brought into a warm room, and the cylinder, the ſtands, the jars, &c. be made thoroughly dry.

3. Before the machine be uſed, the cylinder ſhould be firſt wiped very clean with a ſoft linen cloth that is dry, clean, and warm; and afterwards with a clean hot flannel, or an old ſilk handkerchief: this done, if the winch be turned when the prime conductor and other inſtruments are removed from the electrical machine, and the knuckle be held at a little diſtance from the ſurface of the cylinder, it will be ſoon perceived, that the electric fluid comes like a wind from the cylinder to the knuckle; and, if the motion be a little continued, ſparks and crackling will ſoon follow. This indicates that the machine is in good order, and the electrician may proceed to perform his experiments. But if, when the winch is turned for ſome time, no wind is felt upon the knuckle, then the fault is, very likely, in the rubber: and to remedy that, uſe the following directions: By looſening the ſcrews on the back of the rubber, remove it from its glaſs pillar, and keep it a little near the fire, ſo that its ſilk part may be dried; take now a dry piece of mutton ſuet, or a little tallow from a candle, and juſt paſs it over the leather of the rubber; then ſpread a ſmall quantity of the above deſcribed amalgam over it, and force it as much as poſſible into the leather. This done, replace the rubber upon the glaſs pillar; let the glaſs cylinder be wiped once more, and then the machine is fit for uſe.

4. Sometimes the machine will not work well becauſe the rubber is not ſufficiently ſupplied with electric fluid; which happens when the table, upon which the machine ſtands, and to which the chain of the rubber is connected, is very dry, and conſequently in a bad conducting ſtate. Even the floor and the walls of the room are, in very dry weather, bad conductors, and they cannot ſupply the rubber ſufficiently. In this caſe the beſt expedient is, to connect the chain of the rubber, by means of a long wire, with ſome moiſt ground, a piece of water, or with the iron work of a water-pump; by which means the rubber will be ſupplied with as much electric fluid as is required.

5. When a ſufficient quantity of amalgam has been accumulated upon the leather of the rubber, and the machine does not work very well, then, inſtead of putting on more amalgam, it will be ſufficient to take the rubber off, and to ſcrape a little that which is already upon the leather.

6. It will be often obſerved, that the cylinder, after being uſed ſome time, contracts ſome black ſpots, occaſioned by the amalgam, or ſome foulneſs of the rubber, which grow continually larger, and greatly obſtruct its electric power. Theſe ſpots muſt be carefully taken off, and the cylinder muſt be frequently wiped in order to prevent its contracting them.

7. In charging electric jars in general, it muſt be obſerved, that not every machine will charge them equally high. That machine whoſe electric power is the ſtrongeſt, will always charge the jars higheſt. If the coated jars, before they are uſed, be made a little warm, they will receive and hold the charge the better.

8. If ſeveral jars are connected together, among which there is one that is apt to diſcharge itſelf very ſoon, then the other jars will ſoon be diſcharged with that; although they may be capable of holding a very great charge by themſelves. When electric jars are to be diſcharged, the electrician muſt be cautious, leſt by ſome circumſtance not adverted to, the ſhock ſhould paſs through any part of his body; for an unexpected ſhock, though not very ſtrong, may occaſion ſeveral diſagreeable accidents. In making the diſcharge, care muſt be taken that the diſcharging rod be not placed on the thinneſt part of the glaſs, for that may cauſe the breaking of the jar.

9. When large batteries are diſcharged, jars will be often found broken in it, which burſt at the time of the diſcharge. To remedy this inconvenience, Mr Nairne ſays, he has found a very effectual method, which is, never to diſcharge the battery through a good conductor, except the circuit be at leaſt five feet long. Mr Nairne ſays, that ever ſince he made uſe of this precaution, he has diſcharged a large battery near a hundred times without ever breaking a ſingle jar, whereas before he was continually breaking them. But here it muſt be conſidered, that the length of the circuit weakens the force of the ſhock proportionably; the higheſt degree of which is in many experiments required.

10. It is adviſable, when a jar, and eſpecially a battery, has been diſcharged, not to touch its wires with the hand, before the diſcharging rod be applied to its ſides a ſecond and even a third time; as there generally remains a reſiduum of the charge, which is ſometimes very conſiderable.

11. When any experiment is to be performed which requires but a ſmall part of the apparatus, the remaining part of it ſhould be placed at a diſtance from the machine,

ELECTRICITY. Plate CLXXV.

Fig. 34.

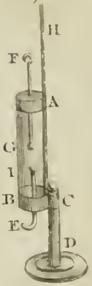


Fig. 33.

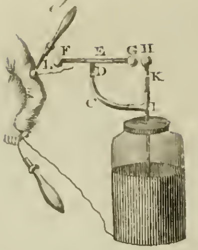


Fig. 32.

Fig. 31.

Fig. 30.

Fig. 29.

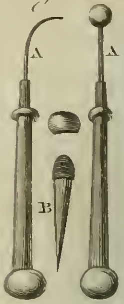


Fig. 38.

Fig. 37.

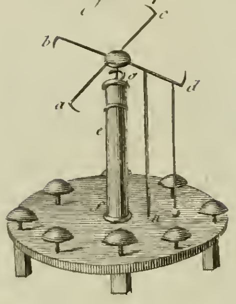


Fig. 36.

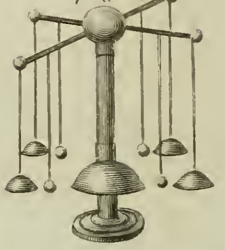


Fig. 35.

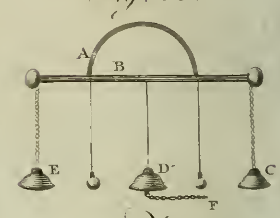


Fig. 43.

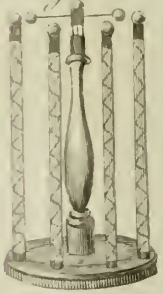


Fig. 40.

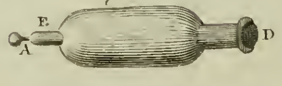


Fig. 39.

Fig. 41.

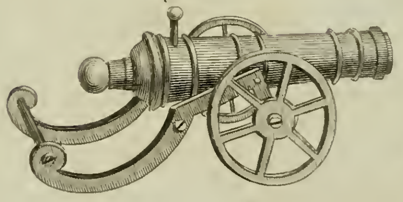


Fig. 42.

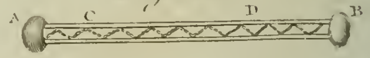


Fig. 50.

Fig. 48.

Fig. 46.

Fig. 44.

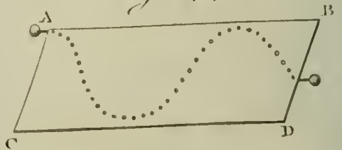


Fig. 51.

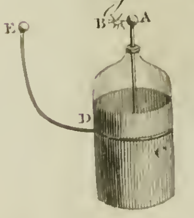
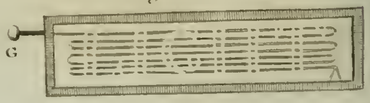


Fig. 49.

Fig. 47.

Fig. 45.



A. Bell Prin. Wal. Sculptor fecit.

Entertaining Experiments.

machine, the prime conductor, and even from the table, if that is not very large. Candles, particularly, ſhould be placed at a conſiderable diſtance from the prime conductor, for the effluvia of their flames carry off much of the electric fluid.

## Sect. VIII. *Entertaining Experiments.*

### I. *The Electrified Cork-ball Electrometer.*

Fix at the end of the prime conductor a knobbed rod, and hang on it two ſmall cork-balls ſuſpended by threads of equal length. The balls will now touch one another, the threads hanging perpendicularly, and parallel to each other. But if the cylinder of the machine be whirled by turning the winch, then the cork-balls will repel one another; and more or leſs according as the electricity is more or leſs powerful.—If the electrometer be hung to a prime conductor negatively electrified, *i. e.* connected with the inſulated rubber of the machine, the cork-balls will alſo repel each other. If, in this ſtate of repulſion, the prime conductor is touched with ſome conducting ſubſtance not inſulated, the cork-balls will immediately come together. But if, inſtead of the conducting ſubſtance, the prime conductor is touched with an electric, as for inſtance a ſtick of ſealing-wax, a piece of glaſs, &c. then the cork-balls will continue to repel each other; becauſe the electric fluid cannot be conducted through that electric: hence we have an eaſy method of determining what bodies are conductors and what electrics. This electrical repulſion is alſo ſhown by a large downy feather, or ſtill more agreeably by the repreſentation of a human head with hair, as ſhown fig. 47. for there the electric repulſion will make the hair erect itſelf in a ſtrange manner. If the feather is uſed, it will appear beautifully ſwelled by the divergency of its down.

### II. *Attraction and Repulſion of light Bodies.*

Connect with the prime conductor, by means of the hook *H*, the two parallel braſs plates *F*, *G*, as repreſented in fig. 38. at about three inches diſtance from one another; and upon the lower plate put any kind of light bodies, as bran, bits of paper, bits of leaf-gold, &c.; then work the machine, and the light bodies will ſoon move between the two plates, leaping alternately from one to the other with great velocity. If, inſtead of bran or irregular pieces of other matter, ſmall figures of men or other things cut in paper and painted, or rather made of the pith of alder, be put upon the plate, they will generally move in an erect poſition, but will ſometimes leap one upon another, or exhibit different poſtures, ſo as to afford a pleaſing ſpectacle to an obſerving company. When bran or other ſubſtances of that kind are made uſe of, it will be proper to incloſe both plates in a glaſs cylinder, by which the bran will be kept from diſperſing and flying about the room.

The phenomena of electric attraction and repulſion may be repreſented alſo with a glaſs tube, or a charged bottle, and ſome of them in a manner more ſatiſfactory than with the machine.

### III. *The Flying-feather, or Shuttle-cock.*

Take a glaſs tube (whether ſmooth or rough is not material); and after having rubbed it, let a ſmall light feather be let out of your fingers at the diſtance of about eight or nine inches from it. This feather will be immediately attracted by the tube, and will ſtick very cloſe to its ſurface for about two or three ſeconds, and ſometimes longer; after which time it will be repelled; and if the tube be kept under it, the feather will continue floating in the air at a conſiderable diſtance from the tube, without coming near it again, except it firſt touches ſome conducting ſubſtance; and if you manage the tube dexterouſly, you may drive the feather through the air of a room at pleaſure.

There is a remarkable circumſtance attending this experiment; which is, that if the feather be kept at a diſtance from the tube by the force of electric repulſion, it always preſents the ſame part towards the tube:—You may move the excited tube about the feather very ſwiftly, and yet the ſame ſide of the feather will always be preſented to the tube.

This experiment may be agreeably varied in the following manner: A perſon may hold in his hand an excited tube of ſmooth glaſs, and another perſon may hold an excited rough glaſs tube, a ſtick of ſealing-wax, or in ſhort another electric negatively electrified, at about one foot and a half diſtance from the ſmooth glaſs tube: a feather now may be let go between theſe two differently excited-electrics, and it will leap alternately from one electric to the other; and the two perſons will ſeem to drive a ſhuttle-cock from one to the other by the force of electricity.

### IV. *The Electric Well.*

Place upon an electric ſtool a metal quart mug, or ſome other conducting body nearly of the ſame form and dimenſion; then tie a ſhort cork-ball electrometer, at the end of a ſilk thread proceeding from the ceiling of the room, or from any other ſupport, ſo that the electrometer may be ſuſpended within the mug, and no part of it may be above the mouth: this done, electrify the mug by giving it a ſpark with an excited electric or otherwiſe; and you will ſee that the electrometer, whilſt it remains in that inſulated ſituation, even if it be made to touch the ſides of the mug, is not attracted by it, nor does it acquire any electricity; but if, whilſt it ſtands ſuſpended within the mug, a conductor, ſtanding out of the mug, be made to communicate with or only preſented to it, then the electrometer is immediately attracted by the mug.

The following experiments require to be made in the dark: for although the electric light in ſeveral circumſtances may be ſeen in the day-light, yet its appearance in this manner is very confuſed; and that the electrician may form a better idea of its different appearances, it is abſolutely neceſſary to perform ſuch experiments in a darkened room.

### V. *The Star and Pencil of Electric Light.*

When the electrical machine is in good order, and the prime conductor is ſituated with the collector ſufficiently near the glaſs cylinder, turn the winch, and you will ſee a lucid ſtar at each of the points of the collector. This ſtar is the conſtant appearance of the electric fluid that is entering a point. At the ſame time you will ſee a ſtrong light proceeding from the rubber;

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rubber, and ſpreading itſelf over the ſurface of the cylinder; and if the excitation of the cylinder is very powerful, denſe ſtreams of fire will proceed from the rubber, and, darting round almoſt half the circumference of the cylinder, will reach the points of the collector. If the prime conductor is removed, the denſe ſtreams of fire will go quite round the cylinder; reaching from one ſide of the rubber to the other. If the chain of the rubber is taken off, and a pointed body, as for inſtance the point of a needle or a pin, is preſented to the back of the rubber, at the diſtance of about two inches, a lucid pencil of rays will appear to proceed from the point preſented, and diverge towards the rubber. If another pointed body be preſented to the prime conductor, it will appear illuminated with a ſtar; but if a pointed wire or other pointed conducting body be connected with the prime conductor, it will throw out a pencil of rays.

### VI. *Drawing Sparks.*

Let the prime conductor be ſituated in its proper place, and electrify it by working the machine; then bring a metallic rod with a round knob at each end, or the knuckle of a finger, within a proper diſtance of the prime conductor, and a ſpark will be ſeen between that and the knuckle or knobbed wire. The longer and ſtronger ſpark is drawn from that end of the prime conductor which is fartheſt from the cylinder, or rather from the extremity of the knobbed rod fixed at its end; for the electric fluid ſeems to acquire an impetus by going through a long conductor, when electrified by a powerful machine. This ſpark appears like a long line of fire, reaching from the conductor to the oppoſed body, and often (particularly when the ſpark is long, and different conducting ſubſtances are near the line of its direction) it will have the appearance of being bended to ſharp angles in different places, exactly reſembling a flaſh of lightning. It often darts bruſhes of light ſidewiſe in every direction.

### VII. *The Electric Light flaſhing between two Metallic Plates.*

Let two perſons, one ſtanding upon an inſulated ſtool, and communicating with the prime conductor, and another ſtanding upon the floor, each hold in one of his hands a metal plate, in ſuch a manner that the plates may ſtand back to back in a parallel ſituation, and about two inches aſunder. Let the winch of the machine be turned, and you will ſee the flaſhes of light between the two plates ſo denſe and frequent, that you may eaſily diſtinguiſh any thing in the room. By this experiment the electric light is exhibited in a very copious and beautiful manner, and it bears a ſtriking reſemblance to lightning.

### VIII. *To fire Inflammable Spirits.*

The power of the electric ſpark to ſet fire to inflammable ſpirits, may be exhibited by ſeveral different methods, but more eaſily thus: Hang to the prime conductor a ſhort rod having a ſmall knob at its end; then pour ſome ſpirits of wine, a little warmed, into a ſpoon of metal; hold the ſpoon by the handle, and place it in ſuch a manner, that the ſmall knob on the rod may be about one inch above the ſurface of the ſpirits. In this ſituation, if, by turning the winch, a ſpark be made to come from the knob, it will ſet the ſpirits on fire. It will generally be found more advantageous to fix the diſh containing the ſpirits upon the prime conductor, as repreſented fig. 48.

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This experiment may be varied different ways, and may be rendered very agreeable to a company of ſpectators. A perſon, for inſtance, ſtanding upon an electric ſtool, and communicating with the prime conductor, may hold the ſpoon with the ſpirits in his hand, and another perſon, ſtanding upon the floor, may ſet the ſpirits on fire by bringing his finger within a ſmall diſtance of it. Inſtead of his finger, he may fire the ſpirits with a piece of ice, when the experiment will ſeem much more ſurpriſing. If the ſpoon is held by the perſon ſtanding upon the floor, and the inſulated perſon brings ſome conducting ſubſtance over the ſurface of the ſpirits, the experiment ſucceeds as well.

### IX. *The artificial Bolognian Stone illuminated by the Electric Light.*

The moſt curious experiment to ſhow the penetrability of the electric light, is made with the real, or more eaſily with the artificial, Bolognian ſtone, invented by the late Mr J. Canton. This phoſphorus is a calcareous ſubſtance, generally uſed in the form of a powder, which has the property of abſorbing light when expoſed to it, and afterwards appearing lucid when brought into the dark *. Take ſome of this powder, and, by means of ſpirits of wine or ether, ſtick it all over the inſide of a clear glaſs phial, and ſtop it with a glaſs ſtopper, or a cork and ſealing-wax. If this phial be kept in a darkened room (which for this experiment muſt be very dark), it will give no light; but let two or three ſtrong ſparks be drawn from the prime conductor, when the phial is kept at about two inches diſtance from the ſparks, ſo that it may be expoſed to that light, and this phial will receive that light, and afterwards will appear illuminated for a conſiderable time. The powder may be ſtuck upon a board by means of the white of an egg, ſo as to repreſent figures of planets, letters, or any thing elſe at the pleaſure of the operator; and the figures may be illuminated in the dark, in the ſame manner as the above-deſcribed phial.

A beautiful method to expreſs geometrical figures with the above phoſphorus, is to bend ſmall glaſs tubes of about the tenth part of an inch diameter, in the ſhape and figure deſired, and then fill them with the phoſphorus powder. Theſe may be illuminated in the manner deſcribed, and they are not ſo ſubject to be ſpoiled as the figures repreſented upon the board frequently are. The beſt method of illuminating this phoſphorus, and which Mr W. Canton generally uſed, is to diſcharge a ſmall electric jar near it.

### X. *The Luminous Conductor.*

Plate CLXX

Fig. 24. repreſents a prime conductor invented by Mr Henley, which ſhows clearly the direction of the electric fluid paſſing through it, from whence it is called the *luminous conductor*. The middle part *E F* of this conductor is a glaſs tube about 18 inches long and three or four inches in diameter. To both ends of this tube the hollow braſs pieces *F D*, *B E*, are cemented air-tight, one of which has a point *C*, by which

* See mistry, n° 141

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which it receives the electric fluid, when ſet near the excited cylinder of the electrical machine, and the other has a knobbed wire $G$, from which a ſtrong ſpark may be drawn; and from each of the pieces $F D$, $B E$, a knobbed wire proceeds within the cavity of the glaſs tube. The braſs piece $F D$, or $B E$, is compoſed of two parts; *i. e.* a cap $F$ cemented to the glaſs tube, and having a hole with a valve, by which the cavity of the glaſs tube is exhauſted of air; and the ball $D$, which is ſcrewed upon the cap $F$. The ſupporters of this inſtrument are two glaſs pillars faſtened in the bottom-board $H$, like the ſupporters of the prime conductor. When the glaſs tube of this conductor is exhauſted of air by means of an air-pump, and the braſs ball is ſcrewed on, as repreſented in the figure, then it is fit for uſe, and may ſerve for a prime conductor to an electrical machine. If the point $C$ of this conductor is ſet near the excited cylinder of the machine, it will appear illuminated with a ſtar; at the ſame time the glaſs tube will appear all illuminated with a weak light; but from the knobbed wire that proceeds within the glaſs from the piece $F D$, a lucid pencil will iſſue out, and the oppoſite knob will appear illuminated with a ſtar, which, as well as the pencil of rays, is very clear, and diſcernible among the other light that occupies the greateſt part of the cavity of the tube. If the point $C$, inſtead of being preſented to the cylinder, be connected with the rubber of the machine, the appearance of light within the tube will be reverſed; the knob which communicates with the piece $F D$ appearing illuminated with a ſtar, and the oppoſite with a pencil of rays; becauſe in this caſe the direction of the electric fluid is juſt the contrary of what it was before; it then going from $D$ to $B$, and now coming from $B$ and going to $D$. If the wires within the tube $E F$, inſtead of being furniſhed with knobs, be pointed, the appearance of light is the ſame; but it ſeems not ſo ſtrong in this as in the other caſe.

### XI. *The Conducting Glaſs Tube.*

Take a glaſs tube of about two inches diameter, and about two feet long; fix to one of its ends a braſs cap, and to the other a ſtop-cock or a valve; then, by means of an air-pump, exhauſt it of air. If this tube be held by one end, and its other end be brought near the electrified prime conductor, it will appear to be full of light whenever a ſpark is taken by it from the prime conductor, and much more ſo if an electric jar be diſcharged through it. This experiment may alſo be made with the receiver of an air-pump: take, for inſtance, a tall receiver, clean and dry; and through a hole at its top inſert a wire, which muſt be cemented air tight. The end of the wire that is within the tube muſt be pointed, but not very ſharp; and the other end muſt be furniſhed with a knob. Put this receiver upon the plate of the air-pump, and exhauſt it. If now the knob of the wire at the top of the receiver be touched with the prime conductor, every ſpark will paſs through the receiver in a denſe and large body of light, from the wire to the plate of the air-pump. When any thing is to be touched with the prime conductor that is not very portable, as the air-pump above mentioned, the communication between the former and the latter may be made by means of a rod furniſhed with an electric handle, or the like.

### XII. *The Aurora Borealis.*

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Plate CLXXIV. fig. 21.

Take a phial nearly of the ſhape and ſize of a Florence flaſk; fix a ſtop-cock or a valve to its neck, and exhauſt it of air as much as poſſible with a good air-pump. If this glaſs is rubbed in the common manner uſed to excite electrics, it will appear luminous within, being full of a flaſhing light, which plainly reſembles the aurora borealis or northern light. This phial may alſo be made luminous, by holding it by either end, and bringing the other end to the prime conductor; in this caſe, all the cavity of the glaſs will inſtantly appear full of flaſhing light, which remains in it for a conſiderable time after it has been removed from the prime conductor. Inſtead of the above-deſcribed glaſs veſſel, a glaſs tube exhauſted of air and hermetically ſealed may be uſed, and perhaps with better advantage. The moſt remarkable circumſtance of this experiment is, that if the phial, or tube, after it has been removed from the prime conductor (and even ſeveral hours after its flaſhing light hath ceaſed to appear), be graſped with the hand, ſtrong flaſhes of light will immediately appear within the glaſs, which often reach from one of its ends to the other.

### XIII. *The Viſible Electric Atmoſphere.*

Plate CLXXIV.

$G I$, fig. 26. repreſents the receiver with the plate of an air-pump. In the middle of the plate $I F$, a ſhort rod is fixed, having at its top a metal ball $B$ nicely poliſhed, whoſe diameter is nearly two inches. From the top of the receiver, another rod $A D$, with a like ball $A$, proceeds, and is cemented air-tight in the neck $C$; the diſtance of the balls from one another being about four inches, or rather more. If, when the receiver is exhauſted of air, the ball $A$ be electrified poſitively, by touching the top $D$ of the rod $A D$ with the prime conductor, or an excited glaſs tube, a lucid atmoſphere appears about it, which although it conſiſts of a feeble light, is yet very conſpicuous, and very well defined; at the ſame time, the ball $B$ has not the leaſt light. This atmoſphere does not exiſt all round the ball $A$; but reaches from about the middle of it, to a ſmall diſtance beyond that ſide of its ſurface which is towards the oppoſite ball $B$. If the rod with the ball $A$ be electrified negatively, then a lucid atmoſphere, like the above deſcribed, will appear upon the ball $B$, reaching from its middle to a ſmall diſtance beyond that ſide of it that is towards the ball $A$; at the ſame time, the negatively electrified ball $A$ remains without any light. The operator in this experiment muſt be careful not to electrify the ball $A$ too much; for then the electric fluid will paſs in a ſpark from one ball to the other, and the experiment will not have the deſired effect. A little practice, however, will render the operation very eaſy and familiar.

### XIV. *Of charging and diſcharging a Phial in general.*

Plate CLXXIV.

Take a coated jar, and place it upon the table near the prime conductor, ſo that the knob of its wire, and that only, may be in contact with it: fix the quadrant electrometer fig. 15. upon the prime conductor, and then turn the winch of the machine. You will obſerve, that as the jar is charging, the index of the electrometer will riſe gradually as far as 90°, or thereabouts, and then reſt: when this happens, you may conclude that the jar has received its full charge. If now you take a diſcharging rod, and holding it by the glaſs handle, apply firſt one of its knobs to the outſide coating of the jar, and then bring the other knob near the knob of the wire of the jar, or near the prime conductor that communicates with it, you will hear a report, and ſee very vivid ſparks between the diſcharging rod and the conducting ſubſtances, communicating with the ſides of the jar. This operation diſcharges the jar. If, inſtead of uſing the diſcharging rod, you touch the outſide of the jar with one hand, and bring the other hand near the wire of the jar, the ſame ſpark and report will follow; but now you will feel a ſhock which affects your wriſts, elbows, and if ſtrong, your breaſt alſo. If a number of perſons join hands, and the firſt of them touches the outſide of the jar, and the laſt touches the wire communicating with the inſide, they will all feel the ſhock, and preciſely at the ſame perceivable time. This ſhock, bearing no reſemblance to any ſenſation otherwiſe felt, cannot conſequently be deſcribed; and in order that a perſon may form a juſt idea of it, he muſt abſolutely feel it. A ſhock may be given to any ſingle part of the body, if that part only be brought into the circuit.

### XV. *The Leyden Vacuum.*

Plate CLXXIV.

Fig. 22. 23. repreſent a ſmall phial coated on the outſide, about three inches up the ſides, with tin-foil; at the top of the neck of this phial, a braſs cap is cemented, having a hole with a valve, and from the cap a wire proceeds a few inches within the phial, terminating in a blunt point. When this phial is exhauſted of air, a braſs ball is ſcrewed upon the braſs cap, which is cemented into its neck, ſo as to defend the valve, and prevent any air from getting into the exhauſted glaſs. This phial exhibits clearly the direction of the electric fluid, both in charging and diſcharging; for if it be held by its bottom, and its braſs knob be preſented to the prime conductor poſitively electrified, you will ſee that the electric fluid cauſeth the pencil of rays to proceed from the wire within the phial, as repreſented fig. 22; and if it is diſcharged, a ſtar will appear in the place of the pencil, as repreſented in fig. 23. But if the phial is held by the braſs cap, and its bottom be touched with the prime conductor, then the point of the wire on its inſide will appear illuminated with a ſtar when charging, and with a pencil when diſcharging. If it be preſented to a prime conductor electrified negatively, all theſe appearances, both in charging and diſcharging, will be reverſed.

The apparatus repreſented fig. 25. will be found very convenient for the various experiments upon the luminous conductor, Leyden vacuum, jars charged poſitively or negatively, with their different ſtates of inſulation. *A* is an inſulating pillar of glaſs, which is ſcrewed to the wooden foot *B*; and on this pillar all the apparatus may be ſcrewed alternately. *CD* is an exhauſted tube of glaſs, furniſhed at each end with braſs caps; at the end *D* is a valve properly ſecured under the braſs plate; a braſs wire with a ball projects from the upper cap; a pointed wire proceeds from the bottom plate; and this tube is called the *luminous conductor*. The flaſk repreſented at *E* is called the *Leyden vacuum*. It is furniſhed with a valve under the ball *E*; to come at which the more readily, the ball may be unſcrewed: a wire, with a blunt end, projects to within a little of the bottom of the flaſk, the latter being coated with tin-foil; and a female ſcrew is cemented to the bottom, in order to ſcrew it on the pillar *A*. *F* is a ſyringe to exhauſt the air occaſionally, either from the luminous conductor or the Leyden vacuum. To do this, unſcrew the ball of the Leyden vacuum, or the plate of the luminous conductor, and then ſcrew the ſyringe in the place of either of theſe pieces, being careful that the bottom of the female ſcrew *G* bears cloſe againſt the leather which covers the ſhoulders *a b c d*; then work the ſyringe, and in a few minutes the glaſſes will be ſufficiently exhauſted. *H* and *I* are two Leyden bottles; each of which has a female ſcrew fitted to the bottom, in order that they may be conveniently ſcrewed on the pillar *A*; and the bottle *H* is furniſhed with a belt by which it may be ſcrewed ſidewiſe to the ſame. *K* and *L* are two ſmall wires, to be ſcrewed occaſionally either into the ball *E*, the knobs *e* or *f*, the cap *c*, or the ſocket *g* on the top of the pillar: the balls may be unſcrewed from theſe wires, which will then exhibit a blunt point. *M* is a wooden table to be ſcrewed occaſionally on the glaſs pillar.

### XVI. *To pierce a Card and other Subſtances with the Electric Exploſion.*

Take a card, a quire of paper, or the cover of a book, and keep it cloſe to the outſide coating of a charged jar; put one knob of the diſcharging rod upon the card, quire of paper, &c. ſo that between the knob and coating of the jar the thickneſs of that card, or quire of paper, only is interpoſed; laſtly, by bringing the other knob of the diſcharging rod near the knob of the jar, make the diſcharge, and the electric matter will pierce a hole (or perhaps ſeveral) quite through the card or quire of paper. This hole has a bur raiſed on each ſide, except the card, &c. be preſſed hard between the diſcharging rod and the jar; which ſhows that the hole is not made in the direction of the paſſage of the fluid, but in every direction from the centre of the reſiſting body. If this experiment be made with two cards inſtead of one, which however muſt be kept very little diſtant from one another, each of the cards, after the exploſion, will be found pierced with one or more holes, and each hole will have burs on both ſurfaces of each card. The hole, or holes, are larger or ſmaller, according as the card, &c. is more damp or more dry. It is remarkable, that if the noſtrils are preſented to it, they will be affected with a ſulphureous, or rather a phoſphoreal ſmell, juſt like that produced by an excited electric.

If, inſtead of paper, a very thin plate of glaſs, roſin, ſealing-wax, or the like, be interpoſed between the knob of the diſcharging rod and the outſide coating of the jar, on making the diſcharge, this will be broken in ſeveral pieces. Small inſects may alſo be killed in this manner. They may be held between the outſide coating of the jar and the knob of the diſcharging rod, like the above card; and a ſhock of a common phial ſent through them, will inſtantly deprive them of life, if they are pretty ſmall: but if larger, they will be affected in ſuch a manner, as to appear quite dead on firſt receiving the ſtroke; but will, after ſome time, recover: this, however, depends on the quantity of the charge ſent through them.

### XVII. *To ſhow the Effect of the Shock ſent over the Surface of a Card or other Subſtances.*

PUT the extremities of two wires upon the ſurface of a card, or other body of an electric nature, ſo that they may be in one direction, and about one inch diſtance from one another; then, by connecting one of the wires with the outſide of a charged jar, and the other wire with the knob of the jar, the ſhock will be made to paſs over the card or other body. If the card be made very dry, the lucid track between the wires will be viſible upon the card for a conſiderable time after the exploſion. If a piece of common writing paper be uſed inſtead of the card, it will be torn by the exploſion into very ſmall bits.

If, inſtead of the card, the exploſion is ſent over the ſurface of a piece of glaſs, this will be marked with an indelible track, which generally reaches from the extremity of one of the wires to the extremity of the other. In this manner, the piece of glaſs is very ſeldom broken by the exploſion. But Mr Henley has diſcovered a very remarkable method to increaſe the effect of the exploſion upon the glaſs; which is by preſſing with weights that part of the glaſs which lies between the two wires (*i. e.* that part over which the ſhock is to paſs). He puts firſt a thick piece of ivory upon the glaſs, and places upon that ivory a weight at pleaſure, from one quarter of an ounce to ſix pounds: The glaſs in this manner is generally broken by the exploſion into innumerable fragments, and ſome of it is abſolutely reduced into an impalpable powder. If the glaſs is very thick, and reſiſts the force of the exploſion, ſo as not to be broken by it, it will be found marked with the moſt lively priſmatic colours, which are thought to be occaſioned by very thin laminæ of the glaſs, in part ſeparated from it by the ſhock. The weight laid upon the glaſs is always ſhook by the exploſion, and ſometimes it is thrown quite off from the ivory. This experiment may be moſt conveniently made with the univerſal diſcharger, fig. 8.

### XVIII. *To ſwell Clay, and break ſmall Tubes, by the Electric Exploſion.*

ROLL up a piece of ſoft tobacco-pipe clay in a ſmall cylinder, and inſert in it two wires, ſo that their ends without the clay may be about a fifth part of an inch from one another. If a ſhock be ſent through this clay, by connecting one of the wires with the outſide of a charged jar, and the other with the inſide, it will be inflated by the ſhock, *i. e.* by the ſpark, that paſſes between the two wires, and, after the exploſion, will appear ſwelled in the middle. If the ſhock ſent through it is too ſtrong, and the clay not very moiſt, it will be broken by the exploſion, and its fragments ſcattered in every direction. To make this experiment with a little variation, take a piece of the tube of a tobacco-pipe, about one inch long, and fill its bore with moiſt clay; then inſert in it two wires, as in the above rolled clay; and ſend a ſhock through it. This tube will not fail to burſt by the force of the exploſion, and its fragments will be ſcattered about to a great diſtance. If, inſtead of clay, the above-mentioned tube of the tobacco-pipe, or a glaſs tube (which will anſwer as well), be filled with any other ſubſtance, either electric or non-electric, inferior to metal, on making the diſcharge, it will be broken in pieces with nearly the ſame force. This experiment is the invention of Mr Lane, F. R. S.

### XIX. *To make the Electric Spark viſible in Water.*

FILL a glaſs tube of about half an inch diameter, and ſix inches long, with water; and to each extremity of the tube adapt a cork, which may confine the water; through each cork inſert a blunt wire, ſo that the extremities of the wires within the tube may be very near one another; laſtly, connect one of theſe wires with the coating of a ſmall charged phial, and touch the other wire with the knob of it; by which means the ſhock will paſs through the wires, and cauſe a vivid ſpark to appear between their extremities within the tube. In performing this experiment, care muſt be taken that the charge be exceedingly weak, otherwiſe the tube will burſt. If we place in a common drinking glaſs, almoſt full of water, two knobbed wires, ſo bent, that their knobs may be within a little diſtance of one another in the water, and if one of theſe wires be connected with the outſide coating of a pretty large jar, and the other wire be touched with the knob of it; the exploſion which muſt paſs through the water from the kob of one of the wires to that of the other, will diſperſe the water, and break the glaſs with a ſurpriſing violence. This experiment is very dangerous if not conducted with great caution.

### XX. *To fire Gun-powder.*

MAKE a ſmall cartridge of paper, and fill it with gun-powder, or elſe fill the tube of a quill with it; inſert two wires, one at each extremity, ſo that their ends within the quill, or cartridge, may be about one fifth of an inch from one another: this done, ſend the charge of a phial through the wires; and the ſpark between their extremities, that are within the cartridge, or quill, will ſet fire to the gun-powder. If the gun-powder be mixed with ſteel-filings, it will take fire more readily, and with a very ſmall ſhock.

### XXI. *To ſtrike Metals into Glaſs.*

TAKE two ſlips of common window-glaſs about three inches long, and half an inch wide; put a ſmall ſlip of gold, ſilver, or braſs leaf, between them, and tie them together, or elſe preſs them together between the boards of the preſs *H*, belonging to the univerſal diſcharger fig. 9. Plate CLXXIV. leaving a little of the metallic leaf out between the glaſſes at each end; then ſend a ſhock through this metallic leaf, and the force of the exploſion will drive part of the metal into ſo cloſe a contact with the glaſs, that it cannot be wiped off, or even be affected by the common menſtrua which otherwiſe would diſſolve it. In this experiment the glaſſes are often ſhattered to pieces; but whether they are broken or not, the indelible metallic tinge will always be found in ſeveral places, and ſometimes thro' the whole length of both glaſſes.

Entertaining Experiments.

### XXII. *To ſtain Paper or Glaſs.*

LAY a chain, which forms a part of the circuit between the two ſides of a charged jar, upon a ſheet of white paper; and if a ſhock be ſent through it, the paper will be found ſtained with a blackiſh tinge at the very juncture of the links. If the charge be very large, the paper, inſtead of being ſtained with ſpots, is brunt through. If the chain be laid upon a pane of glaſs inſtead of paper, the glaſs will often be found ſtained with ſpots in ſeveral places, but (as might be expected) not ſo deep as the paper. If this experiment be made in the dark, a ſpark will be ſeen at every juncture of the links; and if the links are ſmall, and the ſhock pretty ſtrong, the chain will appear illuminated like a line of fire.

### XXIII. *The Lateral Exploſion.*

IF a jar be diſcharged with a diſcharging rod that has no electric handle, the hand that holds it, in making the diſcharge, feels ſome kind of ſhock, eſpecially when the charge is conſiderable. In other words: A perſon, or any conducting ſubſtance, that is connected with one ſide of a jar, but forms no part of the circuit, will feel a kind of ſhock, *i. e.* ſome effect of the diſcharge. This may be rendered viſible in the following manner. Connect with the outſide of a charged jar a piece of chain; then diſcharge the jar thro' another circuit, as for inſtance with a diſcharging rod in the common way, and the chain that communicates with the outſide of the jar, and which makes no part of the circuit, will appear lucid in the dark, *i. e.* ſparks will appear between the links; which ſhows, that the electric fluid, natural to that chain, muſt by ſome means have been diſturbed. This chain will alſo appear luminous, if it is not in contact with the outſide of the jar, but only very near it; and on making the diſcharge, a ſpark will be ſeen between the jar and the end of the chain near it. This electrical appearance out of the circuit of a diſcharging jar, is that which we call the *lateral exploſion;* and to make it appear in the moſt conſpicuous manner, obſerve the following method, which is that of Dr Prieſtley.

When a jar is charged, and ſtands upon the table as uſual, inſulate a thick metallic rod, and place it ſo that one of its ends may be contiguous to the outſide coating of the jar; and within about half an inch of its other end place a body of about ſix or ſeven feet in length, and a few inches in breadth: then put a chain upon the table, ſo that one of its ends may be about an inch and a half diſtant from the coating of the jar: at the other end of the chain apply one knob of the diſcharging rod, and bring the other knob to the wire of the jar, in order to make the exploſion. On making the diſcharge in this manner; a ſtrong ſpark will be ſeen between the inſulated rod, which communicates with the coating of the jar and the body near its extremity, which ſpark does not alter the ſtate of that body in reſpect to electricity. Whether this lateral exploſion is received on flat and ſmooth ſurfaces, or upon ſharp points, the ſpark is always equally long and vivid.

### XXIV. *To diſcharge a Jar ſilently.*

WHEN a large jar is fully charged, which would give a terrible ſhock, put one of your hands in contact with its outſide coating; with the other hold a ſharp pointed needle, and keeping the point directed towards the knob of the jar, proceed gradually near it, until the point of the needle touches the knob. This operation diſcharges the jar entirely; and you will either receive no ſhock at all, or ſo ſmall a one as can hardly be perceived. The point of the needle, therefore, has ſilently and gradually drawn all the ſuperfluous fluid from the inſide ſurface of the electric jar.

### XXV. *Drawing the Electricity from the Prime Conductor by a Point.*

LET a perſon hold the knob of a braſs rod at ſuch a diſtance from the prime conductor, that ſparks may eaſily fly from the latter to the former, when the machine is in motion. Then let the winch be turned; and while the ſparks are following one another, preſent the ſharp point of a needle at nearly twice the diſtance from the prime conductor, that the knobbed rod is held; and you will obſerve that no more ſparks will go to the rod:—remove the needle entirely, and the ſparks will be ſeen again;—preſent the needle, and the ſparks diſappear: which evidently ſhows, that the point of the needle draws off ſilently almoſt all the fluid that the cylinder throws upon the prime conductor.

If the needle be fixed upon the prime conductor with the point outward, and the knob of a diſcharging rod, or the knuckle of a finger, be brought very near the prime conductor, though the excitation of the cylinder may be very ſtrong, yet you will perceive that no ſpark, or an exceeding ſmall one, can be obtained from the prime conductor.

### XXVI. *The Electrified Cotton.*

TAKE a ſmall lock of cotton, extended in every direction as much as conveniently can be done; and by a linen thread about five or ſix inches long, or by a thread drawn out of the ſame cotton, tie it to the end of the prime conductor: then let the winch of the machine be turned, and the lock of cotton, on being electrified, will immediately ſwell, by repelling its filaments from one another, and will ſtretch itſelf towards the neareſt conductor. In this ſituation let the winch be kept turning, and preſent the end of your finger, or the knob of a wire, towards the lock of cotton, which will then immediately move towards the finger, and endeavour to touch it; but take with the other hand a pointed needle, and preſent its point towards the cotton, a little above the end of the finger, and you will obſerve the cotton immediately to ſhrink upward, and move towards the prime conductor.—Remove the needle, and the cotton will come again towards the finger. Preſent the needle, and the cotton will ſhrink again.

### XXVII. *The Electrified Bladder.*

TAKE a large bladder well blown, and cover it with gold, ſilver, or braſs leaf, ſticking it with gum-water: ſuſpend this bladder at the end of a ſilk thread, at leaſt ſix or ſeven feet long, hanging from the ceiling of the room; and electrify the bladder, by giving it a ſtrong ſpark with the knob of a charged bottle: this done, take a knobed wire, and preſent it to the bladder when motionleſs; and you will perceive, that as the knob ap-

# ELECTRICITY.

Plate CLXXVI.

Fig. 55.

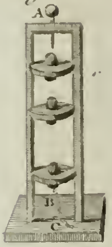

Fig. 54.

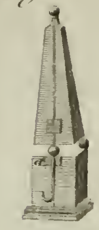

Fig. 53.

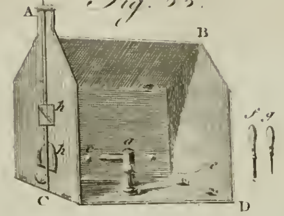

Fig. 52.

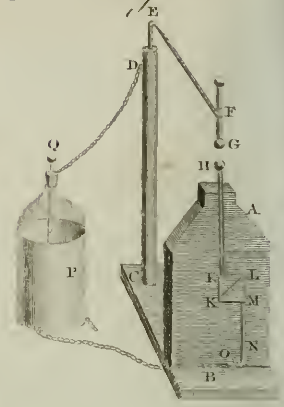

Fig. 59.

Fig. 58.

Fig. 57.

Fig. 56.

Fig. 60.

Fig. 61.

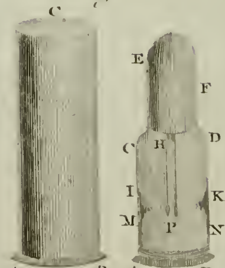

Fig. 65.

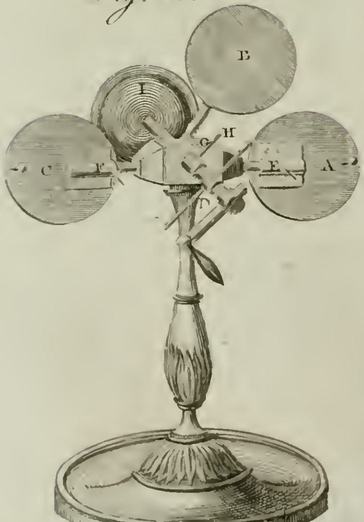

Fig. 62.

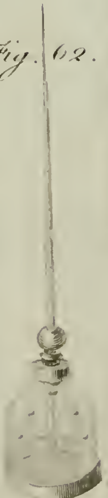

Fig. 66.

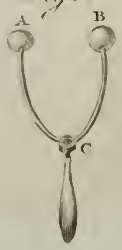

Fig. 64.

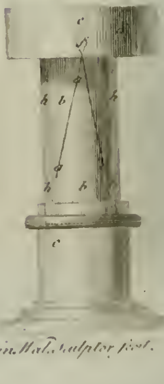

Fig. 63.

A. Bell Prin. Wal. Sculptor fecit.

approaches the bladder, the bladder alſo moves towards the knob, and, when nearly touching it, gives it the ſpark which it received from the charged phial, and thus it becomes unelectrified. Give it another ſpark, and, inſtead of the knobbed wire, preſent the point of a needle towards it, and you will perceive that the bladder will not be attracted by, but rather recede from, the point, eſpecially if the needle be very ſuddenly preſented towards it.

### XXVIII. *The Spider ſeemingly animated by Electricity.*

late XXV.

Fig. 51. repreſents an electric jar, having a wire *C D E* faſtened on its outſide, which is bended ſo as to have its knob *E* as high as the knob *A*.—*B* is a ſpider made of cork, with a few ſhort threads run thro' it to repreſent its legs. This ſpider is faſtened at the end of a ſilk thread, proceeding from the ceiling of the room, or from any other ſupport, ſo that the ſpider may hang mid-way between the two knobs *A*, *E*, when the jar is not charged. Let the place of the jar upon the table be marked; then charge the jar, by bringing its knob *A* in contact with the prime conductor, and replace it in its marked place. The ſpider will now begin to move from knob to knob, and continue this motion for a conſiderable time, ſometimes for ſeveral hours.

The inſide of the jar being charged poſitively, the ſpider is attracted by the knob *A*, which communicates to it a ſmall quantity of electricity; the ſpider then becoming poſſeſſed of the ſame electricity with the knob *A*, is repelled by it, and runs to the knob *E*, where it diſcharges its electricity, and is then attracted by the knob *A*, and ſo on. In this manner the jar is gradually diſcharged; and when the diſcharge is nearly completed, the ſpider finiſhes its motion.

### XXIX. *The Dancing Balls.*

Fix a pointed wire upon the prime conductor, with the point outward; then take a glaſs tumbler, graſp it with your hands, and preſent its inſide ſurface to the point of the wire upon the prime conductor while the machine is in motion: the glaſs in this manner will ſoon become charged; for its inſide ſurface acquires the electricity from the point, and the hands ſerve as a coating for the outſide. This done, put a few pith balls upon the table, and cover them with this charged glaſs tumbler. The balls will immediately begin to leap up along the ſides of the glaſs as repreſented fig. 39. and will continue their motion for a conſiderable time.

### XXX. *The Electrical Jack.*

This is an invention of Dr Franklin's, and turns with conſiderable force, ſo that it may ſometimes be uſed for the purpoſes of a common jack. A ſmall upright ſhaft of wood paſſes at right angles through a thin round board of about 12 inches diameter, and turns on a ſharp point of iron fixed in the lower end, while a ſtrong wire in the upper end, paſſing through a ſmall hole in a thin braſs plate, keeps the ſhaft truly vertical. About 30 radii, of equal length, made of ſaſh-glaſs cut into narrow ſlips, iſſue horizontally from the circumference of the board, the ends moſt diſtant from the centre being about four inches apart. On the end of every one a braſs thimble is fixed. If now the wire of a bottle electrified in the common way be brought near the circumference of this wheel, it will attract the neareſt thimble, and ſo put the wheel in motion. That thimble, in paſſing by, receives a ſpark; and thereby being electrified, is repelled, and ſo driven forwards; while a ſecond, being attracted, approaches the wire, receives a ſpark, and is driven after the firſt; and ſo on, till the wheel has gone once round; when the thimbles before electrified approaching the wire, inſtead of being attracted, as they were at firſt, are repelled, and the motion preſently ceaſes. But if another bottle which had been charged through the coating, or otherwiſe negatively electrified, is placed near the ſame wheel, its wire will attract the thimble repelled by the firſt, and thereby double the force that carries the wheel round. The wheel therefore moves very ſwiftly, turning round 12 or 15 times in a minute, and with ſuch force, that a large fowl ſpitted on the upper ſhaft may be roaſted by means of it.

### XXXI. *The Self-moving Wheel.*

This appears more ſurpriſing than the former, tho' conſtructed upon the ſame principles. It is made of a thin round plate of window-glaſs 17 inches in diameter, well gilt on both ſides, all but two inches next the edge. Two ſmall hemiſpheres of wood are then fixed with cement to the middle of the upper and under ſides, centrally oppoſite; and in each of them a ſtrong thick wire eight or ten inches long, which together make the axis of the wheel. It turns horizontally on a point at the lower end of its axis, which reſts on a bit of braſs cemented within a glaſs ſalt-celler. The upper end of its axis paſſes through a hole in a thin braſs plate, cemented to a long and ſtrong piece of glaſs; which keeps it ſix or eight inches diſtant from any non-electric, and has a ſmall ball of wax or metal on its top to keep in the fire.

In a circle on the table which ſupports the wheel, are fixed 12 ſmall pillars of glaſs, at about 11 inches diſtance, with a thimble on the top of each. On the edge of the wheel is a ſmall leaden bullet, communicating by a wire with the gilding of the upper ſurface of the wheel; and about ſix inches from it is another bullet communicating in like manner with the under ſurface. When the wheel is to be charged by the upper ſurface, a communication muſt be made from the under ſurface to the table. As ſoon as it is well charged, it begins to move. The bullet neareſt to a pillar moves towards the thimble on that pillar; and, paſſing by, electrifies it, and is then repelled from it. The ſucceeding bullet, which communicates with the other ſurface of the glaſs, more ſtrongly attracts that thimble on account of its being electrified before by the other bullet; and thus the wheel increaſes its motion, till the reſiſtance of the air regulates it. It will go half an hour; and make, one minute with another, 20 turns in a minute, which is 600 turns in the whole; the bullet in the upper ſurface giving in each turn 12 ſparks to the thimbles, making in all 2500 ſparks; while the ſame quantity of fire is thought to be received by the under bullet. The whole ſpace moved over by theſe bullets in the mean time is 2500 feet. If;

inſtead of two bullets, you put eight, four communicating with the upper and four with the under ſurface, the force and ſwiftneſs will be greatly increaſed, and the wheel will make about 50 turns in a minute; but then it will not continue moving for ſuch a long time. Theſe wheels may be applied to the ringing of chimes, and the moving of ſmall orreries, &c.

### XXXII. *The Magic Picture.*

Plate CLXXVI. fig. 57.

THIS is a contrivance of Mr Kinnerſley; and is perhaps more calculated to give ſurpriſe than any other experiment in electricity. It is made in the following manner: Having a large mezzotinto, with a frame and glaſs (ſuppoſe of the king), take out the print, and cut a pannel out of it near two inches diſtant from the frame all round. If the cut be through the picture, it is nothing the worſe. With thin paſte, or gum-water, fix the board that is cut off on the inſide of the glaſs, preſſing it ſmooth and cloſe; then fill up the vacancy, by gilding the glaſs well with leaf-gold or braſs. Gild likewiſe the inner edge of the back of the frame all round, except the top part, and form a communication between that gilding and the gilding behind the glaſs; then put in the board, and that ſide is finiſhed. Turn up the glaſs, and gild the foreſide exactly over the back gilding; and when it is dry, cover it, by paſting on the pannel of the picture that has been cut out; obſerving to bring the correſponding parts of the board and picture together, by which the picture will appear of a piece as at firſt; only part is behind the glaſs and part before. Laſtly, hold the picture horizontally by the top, and place a little moveable gilt crown on the king's head. If now the picture is moderately electrified, and another perſon take hold of the frame with one hand, ſo that his fingers touch its inſide gilding, and with the other endeavour to take off the crown, he will receive a terrible blow, and fail in the attempt. The operator, who holds the picture by the upper end, where the inſide of the frame is not gilt, to prevent its falling, feels nothing of the ſhock; and may touch the face of the picture without danger, which he pretends to be a teſt of his loyalty.

### XXXIII. *The Thunder-houſe.*

Fig. 52. is an inſtrument repreſenting the ſide of a houſe, either furniſhed with a metallic conductor, or not; by which both the bad effects of lightning ſtriking upon a houſe not properly ſecured, and the uſefulneſs of metallic conductors, may be clearly repreſented. *A* is a board about three quarters of an inch thick, and ſhaped like the gable-end of a houſe. This board is fixed perpendicularly upon the bottom-board *B*, upon which the perpendicular glaſs pillar *C D* is alſo fixed in a hole about eight inches diſtant from the baſis of the board *A*. A ſquare hole *I L M K*, about a quarter of an inch deep, and nearly one inch wide, is made in the board *A*, and is filled with a ſquare piece of wood nearly of the ſame dimenſions. It is mentioned nearly of the ſame dimenſions, becauſe it muſt go ſo eaſily into the hole, that it may drop off by the leaſt ſhaking of the inſtrument. A wire *L K* is faſtened diagonally to this ſquare piece of wood. Another wire *I H* of the ſame thickneſs, having a braſs ball *H*, ſcrewed on its pointed extremity, is faſtened upon the board *A*; ſo alſo is the wire *M N*, which is ſhaped in a ring at *O*. From the upper extremity of the glaſs pillar *C D*, a crooked wire proceeds, having a ſpring ſocket *F*, through which a double knobbed wire ſlips perpendicularly, the lower knob *G* of which falls juſt above the knob *H*. The glaſs pillar *D C* muſt not be made very faſt into the bottom board; but it muſt be fixed ſo as it may be pretty eaſily moved round its own axis; by which means the braſs ball *G* may be brought nearer or farther from the ball *H*, without touching the part *E F G*. Now when the ſquare piece of wood *L M I K* (which may repreſent the ſhutter of a window or the like) is fixed into the hole ſo, that the wire *L K* ſtands in the dotted repreſentation *I M*, then the metallic communication from *H* to *O* is complete, and the inſtrument repreſents a houſe furniſhed with a proper metallic conductor: but if the ſquare piece of wood *L M I K* is fixed ſo, that the wire *L K* ſtands in the direction *L K*, as repreſented in the figure, then the metallic conductor *H O*, from the top of the houſe to its bottom, is interrupted at *I M*, in which caſe the houſe is not properly ſecured.

Fix the piece of wood *L M I K* ſo, that its wire may be as repreſented in the figure, in which caſe the metallic conductor *H O* is diſcontinued. Let the ball *G* be fixed at about half an inch perpendicular diſtance from the ball *H*; then, by turning the glaſs pillar *D C*, remove the former ball from the latter; by a wire or chain connect the wire *E F* with the wire *Q* of the jar *P*, and let another wire or chain, faſtened to the hook *O*, touch the outſide coating of the jar. Connect the wire *Q* with the prime conductor, and charge the jar; then, by turning the glaſs pillar *D C*, let the ball *G* come gradually near the ball *H*; and when they are arrived ſufficiently near one another, you will obſerve that the jar explodes, and the piece of wood *L M I K* is puſhed out of the hole to a conſiderable diſtance from the thunder-houſe. Now the ball *G*, in this experiment, repreſents an electrified cloud, which, when it is arrived ſufficiently near the top of the houſe *A*, the electricity ſtrikes it; and as this houſe is not ſecured with a proper conductor, the exploſion breaks off a part, *i. e.* knocks off the piece of wood *I M*.

Repeat the experiment with only this variation, *viz.* that this piece of wood *I M* is ſituated ſo, that the wire *L K* may ſtand in the ſituation *I M*, in which caſe the conductor *H O* is not diſcontinued; and you will obſerve, that the exploſion will have no effect upon the piece of wood *L M*, this remaining in the hole unmoved; which ſhows the uſefulneſs of the metallic conductor.

Further. Unſcrew the braſs ball *H* from the wire *H I*, ſo that this may remain pointed. With this difference only in the apparatus, repeat both the above experiments; and you will find that the piece of wood *I M* is in neither caſe moved from its place, nor any exploſion will be heard; which not only demonſtrates the preference of the conductors with pointed termination to thoſe with blunted ones; but alſo ſhows that a houſe furniſhed with ſharp terminations, although not furniſhed with a regular conductor, is almoſt ſufficiently guarded againſt the effects of lightning.

This apparatus is ſometimes made in the ſhape of a houſe, as repreſented fig. 53. where, for the ſake of

Plate XXVI.

diſtinctneſs, the ſide and part of the roof next the eye are not repreſented. The gable-end *AC* repreſents that of the thunder-houſe, and may be uſed in the ſame manner with that above deſcribed, or more readily by the following method. Let one ball of the diſcharging rod touch the ball of the charged jar, and the other the knob *A* of the conductor *AC* of the thunder-houſe; the jar will then of courſe explode, and the fluid will act upon the conductor juſt mentioned. The conducting wire at the windows *hh* muſt be placed in a line. The ſides and gable *AC* of the houſe, are connected with the bottom by hinges; and the building is kept together by a ridge on the roof. To uſe this model, fill the ſmall tube *a* with gunpowder, and ram the wire *c* a little way into the tube; then connect the tube *e* with the bottom of a large jar or battery. When the jar is charged, form a communication from the hook at *C*, on the outſide, to the top of the jar, by the diſcharging rod; the diſcharge will fire the powder, and the exploſion of the latter will throw off the roof, with the ſides, back, and front, ſo that they will all fall down together. The figures *f* and *g* in the ſide of the houſe repreſent a ſmall ramrod for the tube *a*, and a pricker for the touch-hole at *C*. Fig. 54. repreſents a mahogany pyramid, by means of which the ſame experiment may be exhibited. It is uſed in a manner ſimilar to that juſt now deſcribed, the piece at *a* being thrown out by the diſcharge; by which means the upper part falls down in three pieces.

Mr Jones of Holborn makes the front of the common thunder-houſes, as well as the powder-houſe above deſcribed, with two pieces of wood or windows *hh*, which, by being placed in proper ſituations, the one to conduct and the other to reſiſt the fluid, will illuſtrate by one diſcharge the uſefulneſs of good conductors for ſecuring buildings or magazines from the exploſion of thunder, as well as the danger of uſing imperfect ones.

### XXXIV. *The Electric Fly.*

This fly is compoſed of ſmall braſs wires, fig. 49. fixed into a cap of braſs alſo, eaſily moveable upon an axis of the ſame metal, and exactly balanced, ſo that they may turn with the ſmalleſt force. The ends, which ought to be very ſharp, are all bent one way, with regard to one another, as thoſe belonging to *a*, *b*, in the figure; though the two ſets of points conſtituting the two flies there repreſented, are contrary to each other; ſo that the whole flies muſt have a contrary motion. Fixing the axle with the two flies upon the prime conductor, and working the machine, both will begin to turn very ſwiftly, each in a direction contrary to that of the points. In this manner, with a powerful machine, a great many flies may be made to turn either in the ſame or in contrary directions; and by their gradual increaſe or decreaſe in ſize may repreſent a cone or other figure; for the courſe of each will be marked by a line of fire, and thus the whole will exhibit a beautiful appearance in the dark. The light is ſaid to be more brilliant when the ends are ſlightly covered with ſealing-wax, greaſe, or other electric matter.

In this experiment the fly will turn the ſame way whether the electricity be poſitive or negative; the reaſon of which will eaſily be conceived from the theory already laid down, viz. that in poſitive electricity the fluid iſſues from the body electrified, and that in negative electricity it enters into it. In the former caſe, the recoil of the fluid, which acts equally on the air and on the point from whence it iſſues, muſt continually put the point the contrary way; and in negative electricity, when the point ſolicits a continual draught of electric matter from the air, the direct impulſe of the former muſt alſo produce a motion in the point in the courſe in which the fluid itſelf moves. In vacuo no motion is produced; becauſe there is no air on which the fluid may act when it iſſues from the point. In like manner, when air is incloſed in a glaſs veſſel, the motion of the electric fly ſoon ſtops; becauſe the fluid cannot eaſily get through the air and the glaſs, and therefore its motions are impeded ſo that it cannot preſs with force ſufficient to produce motion. On applying a conductor to the outſide of the glaſs, the fly renews its motion; becauſe an opportunity is now given to the fluid to eſcape, by running through the glaſs. But this, for the reaſons already given, muſt ſoon ceaſe, becauſe a contrary action of the fluid inſtantly begins to take place; and in a ſhort time becomes equal to that which urges it forward from the machine. The motion of the fly, therefore, ſtops for the ſame reaſon that a Leyden phial becomes at laſt ſaturated and cannot receive a greater charge; and which has been already ſo fully diſcuſſed, that it would be ſuperfluous to ſay more on the ſubject. Fig. 50. ſhows another fly which turns perpendicularly, and which will be readily underſtood from what has been already ſaid.

### XXXV. *The Electrified Bells.*

Plate CLXXV.

Fig. 35. repreſents an inſtrument having three bells, which are made to ring by electric attraction and repulſion. *B* is a braſs rod, furniſhed with a ring *A* of the ſame metal, by which it is ſuſpended from another rod fixed in the prime conductor. The outer bells *C* and *E* are ſuſpended by braſs chains; but the middle bell *D* and the two ſmall braſs clappers between *CD* and *DE* are ſuſpended by ſilk threads. From the concave under part of the bell *D* a chain proceeds, which falls upon the table, and has a ſilk thread *E* at its extremity. When this apparatus is hung to the conductor by the ring *A*, and the cylinder of the machine gently turned, the clappers will fly from bell to bell with a rapid motion, and the bells will ring as long as they are kept electrified. The two bells *C* and *E* being ſuſpended by braſs chains, are firſt electrified: hence they attract the clappers, communicate to them a little electricity, and repel them to the unelectrified bell *D*; upon which the clappers depoſit their electricity, and move again to the bells *CE*, from which they acquire more, and ſo on. If, by holding the ſilk thread *F*, the chain of the middle bell be raiſed from the table, the bells after ringing a little while will ſtop; becauſe the bell *D* will have no opportunity of conveying the electricity it receives from the clappers to the ground, being inſulated by the ſilk thread. In the dark, ſparks will be ſeen between the clappers and bells.

Fig. 36. repreſents a ſet of bells more elegantly mounted, and which produce a better ſound. In theſe the knob *a* muſt communicate with the conductor when the apparatus is made uſe of. Fig. 37. repreſents

Entertaining Experiments

Plate CLXXV.

a ſet of eight bells otherwiſe conſtructed. The clapper *h* is here ſuſpended by a ſilken thread from the fly *a b c d*: the axis of the fly reſts in a ſmall hole on the top of a glaſs pillar; and its upper part moves freely in, and is confined by a hole in the braſs arm *g*. To make uſe of theſe bells they muſt be applied to the cylinder of the machine, or at leaſt brought very near it when the conductor is removed; ſo that the fly *a b c d* may be about the height of the centre of the cylinder. The latter being then put in motion, the electricity from it proceeding to the fly, will cauſe it to turn round in the manner deſcribed in the foregoing experiment, and the clapper attracted by each of the bells alternately in its rotation; which, if they are properly turned, will produce a pleaſing and harmonious ſound.

### XXXVI. *To fire a Piſtol or Cannon by Inflammable Air.*

Fig. 40. repreſents a braſs piſtol for inflammable air. It conſiſts principally of a chamber, to the mouth *D* of which a cork is fitted: a glaſs tube *F* is cemented into the top of the chamber, through which a braſs wire paſſes, and is bent within ſide ſo as to approach within an eighth part of an inch of the ſide. On the outſide end of this wire is ſcrewed a braſs ball *A*, which ſerves to receive a ſpark from the conductor of the machine, and conduct it in that form to the inſide of the piſtol. The inflammable air with which the piſtol is to be charged may be made in a common ſtone-ware or glaſs bottle, by mixing a handful of iron-filings with about two wine-glaſsfuls of water and near one of oil of vitriol. The air, when thus made, ſhould be kept in a bottle corked up. To make uſe of the piſtol, take out the cork from the bottle, and inſtantly apply the mouth of the piſtol to the mouth of the bottle; and in about ten ſeconds it will be ſufficiently charged: then remove it, and cork both the piſtol and bottle with the utmoſt expedition: then bring the ball *A* near the prime conductor or the knob of a charged jar; and the ſpark that paſſes through the ball, and between the end of the wire withinſide and the ſide of the chamber, will fire the inflammable air with a loud report, and drive the cork to a conſiderable diſtance. Inſtruments to fire inflammable air are often made in the form of a cannon with its carriage, as in fig. 41.

### XXXVII. *The Spiral Tube.*

Fig. 42. repreſents an inſtrument compoſed of two glaſs tubes *C D*, one within another, and cloſed with two knobbed braſs caps *A* and *B*. The innermoſt of theſe has a ſpiral row of ſmall round pieces of tin-foil ſtuck upon its outſide ſurface, and lying at about one-thirtieth of an inch from each other. If this inſtrument be held by one of its extremities, and its other extremity be preſented to the prime conductor, every ſpark that it receives from the prime conductor will cauſe ſmall ſparks to appear between all the round pieces of tin-foil ſtuck upon the innermoſt tube; which in the dark affords a pleaſing ſpectacle, the inſtrument appearing encompaſſed by a ſpiral line of fire.

Fig. 43. repreſents ſeveral ſpiral tubes placed round a board, in the middle of which is ſcrewed a glaſs pillar, and on the top of this pillar is cemented a braſs cap with a fine ſteel point. In this a braſs wire turns, having a braſs ball at each end, nicely balanced on the wire. To make uſe of this apparatus, place the middle of the turning wire under a ball proceeding from the conductor, ſo that it may receive a ſucceſſion of ſparks from the ball; then puſh the wire gently round; and the balls in their relative motions will give a ſpark to each tube, and thereby illuminate them down to the board, which from its brilliancy and rapid motion affords a moſt beautiful and pleaſing ſight.

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The ſmall pieces of tin-foil are ſometimes ſtuck on a flat piece of glaſs *ABCD*, fig. 44. ſo as to repreſent various fanciful figures. Upon the ſame principle is the luminous word *light* produced. It is formed by the ſmall ſeparations of the tin-foil paſted on a piece of glaſs fixed in a frame of baked wood, as repreſented fig. 45. To uſe this, the frame muſt be held in the hand, and the ball *G* preſented to the conductor. The ſpark then will be exhibited in the intervals compoſing the word; from whence it paſſes to the hook at *b*, and thence to the ground by a chain. The brilliancy of this is equal to that of the ſpirals.

### XXXVIII. *To fire a Piece of Iron-wire in Dephlogiſticated Air.*

Plate CLXXI

The apparatus for this is repreſented fig. 28. n° 2. where the wire is twiſted into a ſpiral figure. When this is done, it may eaſily be inſerted in the braſs knob *D*. The jar comes out of the bottom *C*, and is filled with the dephlogiſticated air, as directed under the article Aerology. The electricity of a common jar being then inſtantly ſent down through the ball and wire at *A*, an exploſion takes place betwixt the end of the ſmall wire and the lower ball *B*, which ſets the end of the former on fire. It burns with remarkable brightneſs; and by reaſon of the ſpiral ſhape into which it is twiſted, ſhows the appearance of a ſmall ſun moving from the top to the bottom of the jar, and ſlowly moving round as the wire, which is of a ſpiral ſhape, gradually burns away.

### XXXIX. *The Electrified Capillary Syphon.*

Plate CLXX

Let a ſmall bucket of metal filled with water be ſuſpended from the prime conductor, and put in a glaſs ſyphon ſo narrow in the extremity that the water may juſt drop from it. If in this diſpoſition of the apparatus the winch of the machine be turned, the water, which when not electrified run out only by drops, will now run in a full ſtream, or even be ſubdivided into ſmaller ſtreams; and if the experiment be made in the dark, the appearance will be very beautiful. The ſame phenomenon will be exhibited by a ſmall bucket with a jet, as repreſented fig. 46. or the experiment may be agreeably varied, by hanging one bucket from a poſitive conductor and another from a negative one; ſo that the ends of the tubes or jets may be about three or four inches from each other. The ſtream iſſuing from the one will be attracted by that iſſuing from the other, and both will unite into one; but though both are luminous in the dark before meeting, the united ſtream will not be ſo unleſs the one electricity has been ſtronger than the other.

### XL. *To illuminate Eggs.*

Plate CLXX

Fig. 55. repreſents a mahogany ſtand ſo conſtructed as to hold three eggs at a greater or ſmaller diſtance, according to the poſition of the ſliding pieces. A chain *C* is placed at the bottom in ſuch a manner as to

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to touch the bottom of the egg at $B$ with one end, and with its other the outſide coating of a charged jar. The ſliding wire $A$ at top is made to touch the upper egg; and the diſtance of the eggs aſunder ſhould not exceed the quarter or eighth part of an inch. The electricity being by means of the diſcharging rod ſent down the ball and wire at $A$, will in a darkened room render the eggs very luminous and tranſparent, as has already been mentioned.

### XLI. *To render Ivory or Boxwood luminous.*

Place an ivory ball on the prime conductor of the machine, and take a ſtrong ſpark, or ſend the charge of a Leyden bottle through its centre, the ball will appear perfectly luminous; but if the charge be not taken through the centre, it will paſs over the ſurface of the ball and corrode it. A ſpark taken through a ball of boxwood not only illuminates the whole, but makes it appear of a beautiful crimſon or rather fine ſcarlet colour.

### XLII. *To illuminate Water.*

Connect one end of a chain with the outſide of a charged jar, and let the other lie upon the table. Place the end of another piece of chain at about one quarter of an inch from the former; then ſet a decanter of water on theſe ſeparated ends; and on making a diſcharge, the water will appear perfectly and beautifully luminous.

### XLIII. *To make a beautiful Appearance* in vacuo.

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Fig. 58. repreſents a glaſs barometer tube, having on the end $B$ a ſteel cap faſtened to the glaſs with cement. From this proceed a wire and ball $c\,d$. Fill this tube with quickſilver; and then by ſending up a large bubble of air, and repeatedly inverting the tube, free the quickſilver and iron ball from air: then put a ſmall drop of ether on the quickſilver, and put the finger on the end of the glaſs tube; and then invert the end $f$ in a baſon of quickſilver, taking care not to remove the finger from the end of the tube till the latter be immerged under the ſurface of the quickſilver. When the finger is removed, the mercury will deſcend, and the ether expand itſelf; preſent the metallic top of the tube to a large charged conductor, and a beautiful green ſpark will paſs through the vapour of the ether from the ball $d$ to the quickſilver. By admitting a ſmall quantity of air into the tube, an appearance ſomething like a falling ſtar is produced.

### XLIV. *To render Gold-leaf or Dutch-metal luminous.*

This is done by diſcharging the contents of a ſmall Leyden jar over it. A ſtrip of gold leaf one-eighth of an inch in breadth and a yard long, will frequently be illuminated throughout its whole extent, by the exploſion of a jar containing two gallons. This experiment may be beautifully diverſified, by laying the gold or ſilver leaf on a piece of glaſs, and then placing the glaſs in water; for the whole gold-leaf will appear moſt brilliantly luminous in the water, by expoſing it thus circumſtanced to the exploſion of a battery.

### XLV. *To perforate a Glaſs Tube.*

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Fig. 59. repreſents a ſmall glaſs tube ſtopped at one end with a piece of cork; $k$ is a wire with a ball, at one end of which is a braſs ball; the other paſſes thro' a cork fitted to the upper part of the tube. This end of the wire is bent at right angles, in ſuch a manner as to approach the ſide of the tube. To perform the experiment, take out the upper cork and wire, and then pour ſome ſallad oil into the tube; replace the cork, and puſh down the wire, ſo that the end of it may be near or rather below the ſurface of the oil; preſent the ball to the electrified conductor, holding the finger or any other conducting ſubſtance oppoſite to the bent end of the wire; and when the ſpark paſſes from the conductor to the braſs ball, the ſame will paſs along the wire, perforating the tube in order to get at the finger, and produce a curious agitation of the oil.

### XLVI. *The Inflammable Air-lamp.*

Fig. 60. repreſents this machine, which is an invention of M. Volta. $A$ is a glaſs globe to contain the inflammable air; $B$, a glaſs baſon or reſervoir to hold water; $D$, a cock to form occaſionally a communication between the reſervoir of water and that of air. The water paſſes into the latter through the metal pipe $gg$, which is fixed to the upper part of the reſervoir $A$; as $s$ is a ſmall cock to cut off or open a communication with the air in the ball and the jet $K$. — $N$ is a ſmall pipe to hold a piece of wax taper; $L$, a braſs pillar, on the top of which is a ball of the ſame metal; $a$ is a pillar of glaſs with a ſocket at top, in which the wire $b$ ſlides, having a ball ſcrewed on the end of it. $F$ is a cock by which the ball $A$ is filled with inflammable air, and which afterwards ſerves to confine the air, and what water falls from the baſon $B$ into the ball $A$.

To uſe this inſtrument, after having filled the reſervoir $A$ with pure inflammable air and the baſon with water, turn the cocks $D$ and $s$, and the water which falls from the baſon $B$ will force out ſome of the inflammable air, and cauſe it to paſs through the jet $K$ into the air. If an electric ſpark be made to paſs from the braſs ball $m$ to that marked $n$, the inflammable jet which paſſes through the pipe $K$ will be fired. To extinguiſh the lamp, firſt ſhut the cock $s$, and then the cock $D$. The inflammable air is made of the uſual ingredients, *viz.* iron-filings and vitriolic acid; and the reſervoir is filled in the following manner: Having previouſly filled $A$ with water, place the foot $R$ in a tub of that fluid which may cover it, ſo that the bent glaſs tube through which the air paſſes may paſs commodiouſly below the foot of the lamp. When the air has nearly driven out all the water, turn the cock $F$, and the apparatus is ready for uſe. This inſtrument is convenient for preſerving a quantity of inflammable air ready for any occaſional experiment, as charging the inflammable air-piſtol, &c. It is alſo convenient for lighting a candle for economical purpoſes, as the leaſt ſpark from an electrophorus or a ſmall bottle is ſufficient to fire the air.

### XLVII. *Imitations of the Planetary Motions.*

See below, *Uſes of the Electric Fluid in the Syſtem of Nature.*

### XLVIII. *Beautiful Figures produced in Powdered Roſin, &c. ſtrewed over an Electric Subſtance.* Ibid.

Sect.

## SECT. IX. *Experiments of a Miſcellaneous Nature,* viz. *thoſe relating to the Effects of the Electric Fluid on Colours; on its Velocity; the Changes of Electric into Conducting Subſtances; the impoſſibility of forcing the Fluid through a perfect Vacuum; the Power of Batteries; its Direction in various Caſes; Improvements in the Method of Excitation, &c.*

These experiments, though far from being unentertaining, we have thought proper to claſs under a different title, as many might wiſh to amuſe themſelves with producing an agreeable and beautiful phenomenon who would not chooſe to make experiments for the ſake of inveſtigating unknown ſubjects, where perhaps little elſe than the labour of making the experiment might be the reward of the operator. Theſe experiments alſo may be truly ſaid to be of an anomalous nature; as not being founded upon any known laws of electricity, but rather a collection of facts; from ſome of which we may afterwards deduce the laws by which this ſubtile fluid is occaſionally governed. We ſhall begin with experiments made by Mr Cavallo upon ſubſtances painted over with colours of different kinds. They were occaſioned by his having obſerved that an electric ſhock, ſent over the ſurface of a card, made a black ſtroke upon a red ſpot, from which he was induced to try the effect of ſending ſhocks over cards painted with different water-colours. The force employed was generally about one foot and an half of charged glaſs; and the ſhocks were ſent over the cards while the latter were in a very dry ſtate.

"Vermilion was marked with a ſtrong black track, about one-tenth of an inch wide. This ſtroke is generally ſingle, as repreſented by *A B*, fig. 74. n° 2. of Plate CLXXVII. Sometimes it is divided in two towards the middle, like *E F*; and ſometimes, particularly when the wires are ſet very diſtant from one another, the ſtroke is not continued, but interrupted in the middle, like *G H*. It often, although not always, happens, that the impreſſion is marked ſtronger at the extremity of that wire from which the electric fluid iſſues, as it appears at *E*, ſuppoſing that the wire *C* communicates with the poſitive ſide of the jar; whereas the extremity of the ſtroke, contiguous to the point of the wire *D*, is neither ſo ſtrongly marked, nor ſurrounds the wire ſo much, as the other extremity *E*.

"Carmine received a faint and ſlender impreſſion of a purple colour.

"Verdigis was ſhaken off from the ſurface of the card; except when it had been mixed with ſtrong gum-water, in which caſe it received a very faint impreſſion.

"White-lead was marked with a long black track, not ſo broad as that on vermilion.

"Red lead was marked with a faint mark much like carmine.

"The other colours I tried were orpiment, gamboge, ſap-green, red-ink, ultramarine, Pruſſian blue, and a few others, which were compounds of the above; but they received no impreſſion.

"It having been inſinuated, that the ſtrong black mark, which vermilion receives from the electric ſhock, might poſſibly be owing to the great quantity of ſulphur contained in that mineral, I was induced to make the following experiment. I mixed together equal quantities of orpiment and flower of ſulphur; and with this mixture, by the help, as uſual, of very diluted gum-water, I painted a card; but the electric ſhock ſent over it left not the leaſt impreſſion.

"Deſirous of carrying this inveſtigation on colours a little further, with a particular view to determine ſomething relative to the properties of lamp-black and oil (c), I procured ſome pieces of paper painted on both ſides with oil colours; and ſending the charge of two feet of coated glaſs over each of them, by making the interruption of the circuit upon their ſurfaces, I obſerved that the pieces of paper painted with lamp-black, Pruſſian blue, vermilion, and purple brown, were torn by the exploſion; but white lead, Naples yellow, Engliſh ochre, and verdigris, remained unhurt.

"The ſame ſhock ſent over a piece of paper painted very thickly with lamp-black and oil left not the leaſt impreſſion. I ſent the ſhock alſo over a piece of paper unequally painted with purple brown, and the paper was torn where the paint lay very thin, but remained unhurt where the paint was evidently thicker. Theſe experiments I repeated ſeveral times and with ſome little variation, which naturally produced different effects; however, they all ſeem to point out the following propoſitions.

"I. A coat of oil-paint over any ſubſtance, defends it from the effects of ſuch an electric ſhock as would otherwiſe injure it; but by no means defends it from any electric ſhock whatever. II. No one colour ſeems preferable to the others, if they are equal in ſubſtance, and equally well mixed with oil; but a thick coating does certainly afford a better defence than a thinner one.

"By rubbing the above mentioned pieces of paper, I find that the paper painted with lamp-black and oil is more eaſily excited, and acquires a ſtronger electricity, than the papers painted with the other colours; and, perhaps, on this account it may be, that lamp-black and oil might reſiſt the ſhock ſomewhat better than the other paints.

"It is remarkable, that vermilion receives the black impreſſion, when painted with lintſeed oil, nearly as well as when painted with water. The paper painted with white lead and oil receives alſo a black mark; but its nature is very ſingular. The track, when firſt made, is almoſt as dark as that marked on white-lead painted

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(c) "It has often been obſerved, that when lightning has ſtruck the maſts of ſhips, it has paſſed over ſuch parts of the maſts as were covered with lamp-black and tar, or painted with lamp-black and oil, without the leaſt injury, at the ſame time that it has ſhivered the uncoated parts in ſuch a manner as to render the maſts uſeleſs."

# ELECTRICITY.

Fig. 68.

Fig. 67.

Fig. 69.

Fig. 70.

Fig. 71.

Fig. 72.

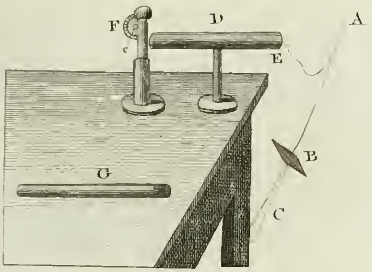


Fig. 74. No. 2.

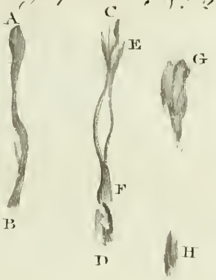


Fig. 73.

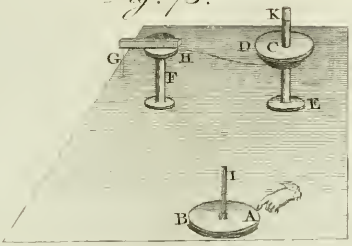


Fig. 75.

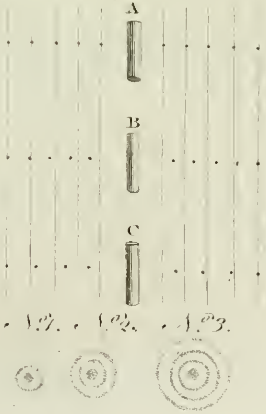



Fig. 78.

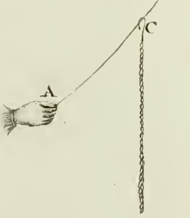
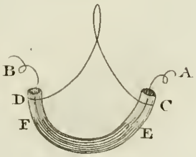


Fig. 76.

Fig. 77.



A. Bell Prim. Mal. Sculptor fecit.

llane- xperi-

painted with water; but it gradually loſes its blackneſs, and in about an hour's time (or longer, if the paint is not freſh) it appears without any darkneſs; and when the painted paper is laid in a proper light, appears only marked with a colourleſs track, as if made by a finger-nail. I ſent the ſhock alſo over a piece of board which had been painted with white-lead and oil about four years before, and the exploſion marked the black track upon this alſo: this track, however, was not ſo ſtrong, nor vaniſhed ſo ſoon, as that marked upon the painted paper; but in about two days time it alſo vaniſhed entirely."

123 tric c cal- , vitri- and re- ies me-

Another very remarkable property of the electric fluid is, that it both calcines, vitrifies, and revivifies, metals. The calcination of them appears from Dr Prieſtley's experiments with the braſs chain, formerly mentioned, where the black duſt was plainly a calx of the metal. The vitrification is performed by exploding ſmall wires of any kind with the ſhock of a battery. In this caſe, the ſmall globules of metal, even though gold, ſilver, or platina, are found to be completely vitrified. The revivification is an experiment of Mr Beccaria. This he did by making the exploſion between two pieces of the calces; and thus he revivified ſeveral metallic ſubſtances, particularly zinc, and even produced real quickſilver from cinnabar. In this caſe, he always obſerved ſtreaks of black beyond the coloured metallic ſtains; owing, as he ſuppoſed, to the phlogiſton driven from the parts that were vitrified, when the other part revivified the calx.

124 Becca- s expe- nts to that electric er ws con ing ances e it.

Mr Beccaria alſo diſcovered another very remarkable property of the electric matter; namely, that when it is obliged to paſs through air, or any other ſubſtance through which it makes its way with difficulty, it throws before it all light conducting ſubſtances it can find, in order to facilitate its own paſſage; and thus it will paſs through a greater quantity of reſiſting medium than it would otherwiſe be able to do. The experiments from which Mr Beccaria drew this concluſion, were the following. He put a narrow piece of leaf-ſilver between two plates of wax, laying it acroſs them, but ſo that it did not quite reach one of the ſides. The diſcharge being made through this ſtrip of metal, by bringing a wire oppoſite to the ſilver, at the place where it was diſcontinued; the ſilver was found melted, and part of it diſperſed all along the track that the electric matter took between the plates of wax, from the ſilver to the wire. Happening once to receive, inadvertently, the charge of a ſmall jar through ſome ſmoke of ſpirit of nitre, a hole was made in his thumb, where the fire entered, and which he thought could only have been made by the acid carried along by the electric fluid. Dr Prieſtley hath made ſeveral more experiments, in order to aſcertain this remarkable property; and of which he gives the following account.

25 Prieſt- expe- nts on ubject.

"I diſcharged frequent ſhocks, both of a common jar, and another of three ſquare feet, through trains of braſs duſt, laid on a ſtool of baked wood, making interruptions in various parts of the train; and always found the braſs duſt ſcattered in the intervals, ſo as to connect the two disjoined ends of the train; but then it was likewiſe ſcattered nearly as much from almoſt all other parts of the train, and in all directions. The ſcattering from the train itſelf was probably occaſioned by ſmall electric ſparks between the particles of the duſt; which, cauſing a vacuum in the air, drove all that light matter to a conſiderable diſtance. But the particles of the duſt, which were ſtrowed in the intervals of the train, ſome of which were at leaſt three inches, could hardly be conveyed in that manner.

Miſcellaneous Experiments.

"When ſmall trains were laid, the diſperſion was the moſt conſiderable, and a light was very viſible in the dark, illuminating the whole circuit. It made no difference, in any of theſe experiments, which way the ſhock was diſcharged.

"When I laid a conſiderable quantity of the duſt at the ends of two pieces of chain, through which the ſhock paſſed, at the diſtance of about three inches from one another, the duſt was always diſperſed over the whole interval, but chiefly laterally; ſo that the greateſt quantity of it lay in arches, extending both ways, and leaving very little of it in the middle of the path. It is probable, that the electric power would have ſpread it equably, but that the vacuum made in the air, by the paſſage of the fluid from one heap of duſt to the other, diſperſed it from the middle part.

"I then inſulated a jar of three ſquare feet, and upon an adjoining glaſs-ſtand laid a heap of braſs duſt; and at the diſtance of ſeven or eight inches a braſs rod communicating with the outſide of the jar. Upon bringing another rod, communicating with the inſide, upon the heap of duſt, it was diſperſed in a beautiful manner, but not one way more than another. However, it preſently reached the rod communicating with the outſide.

"Making two heaps, about eight inches aſunder, I brought one rod communicating with the inſide upon one of them, and another rod communicating with the outſide upon the other. Both the heaps were diſperſed in all directions, and ſoon met; preſently after which the jar was diſcharged, by means of this diſperſed duſt, in one full exploſion. When the two heaps were too far aſunder to promote a full diſcharge at once, a gradual diſcharge was made through the ſcattered particles of the duſt.

"When one heap of duſt was laid in the centre of the ſtand, and the two rods were made to approach on each ſide of it, they each attracted the duſt from the ſide of the heap next to them, and repelled it again in all directions. When they came very near the heap, the diſcharge was made through it, without giving it any particular motion.

"All theſe experiments ſhow, that light bodies poſſeſſed of a conſiderable ſhare of electricity, diſperſe in all directions, carrying the electric matter to places not abounding with it; and that they ſometimes promote a ſudden diſcharge of great quantities of that matter from places where it was lodged, to places where there was a defect of it. But an accident led me to a much more beautiful, and perhaps a more ſatisfactory, manner of demonſtrating the laſt part of this propoſition, than any that I hit upon while I was purſuing my experiments with that deſign.

"Hanging a drop of water upon the knob of a braſs rod communicating with the inſide of my battery, in order to obſerve what variety it might occaſion in the circular ſpots above mentioned, I was greatly ſurpriſed to find the exploſion made all at once, at the diſtance of two inches.

"I

“I afterwards put ſome braſs duſt upon a plate of metal communicating with the inſide of the battery; and making the diſcharge through the duſt, it exploded at the diſtance of an inch and a half. The duſt roſe towards the diſcharged rod, and from thence was diſperſed in all directions.

“Theſe experiments are the more remarkable, as they demonſtrate ſo great a difference between the diſtance at which the battery may be made to diſcharge at once, by the help of theſe light bodies, and without them. When the diſcharge of a battery by the knobs of braſs rods, in the open air, is at the diſtance of about half an inch; it will, by this means, be made at about two inches.”

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Experiments concerning the velocity of the electric fluid.

The motions of the electric fluid, though prodigiouſly quick, are not inſtantaneous. The ſhock of the Leyden phial, indeed, hath been tranſmitted through wires of ſeveral miles in length, without taking up any ſenſible ſpace of time. That is, ſuppoſing two perſons to hold the ends of the wire, one communicating with the knob, and the other with the outſide coating of the phial, both would feel the ſhock at the ſame inſtant; nor would it make any alteration though a conſiderable part of the ſurface of the ground was made part of the conductor. Dr Prieſtley relates ſeveral very curious experiments made with a view to aſcertain this point ſoon after the Lyden phial was diſcovered. Theſe experiments were planned and directed by Dr Watſon, who was preſent at every one of them. His chief aſſiſtants were Martin Folkes, Eſq; preſident of the royal ſociety, Lord Charles Cavendiſh, Dr Bevis, Mr Graham, Dr Birch, Mr Peter Daval, Mr Trembley, Mr Ellicott, Mr Robins, and Mr Short. Many other perſons, and ſome of diſtinction, gave their attendance occaſionally.

Dr Watſon, who wrote the hiſtory of their proceedings, in order to lay them before the royal ſociety, begins with obſerving (what was verified in all their experiments), that the electric ſhock is not, ſtrictly ſpeaking, conducted in the ſhorteſt manner poſſible, unleſs the bodies through which it paſſes conduct equally well; for that, if they conduct unequally, the circuit is always formed through the beſt conductor, though the length of it be ever ſo great.

The firſt attempt theſe gentlemen made, was to convey the electric ſhock acroſs the river Thames, making uſe of the water of the river for one part of the chain of communication. This they accompliſhed on the 14th and 18th of July 1747, by faſtening a wire all along Weſtminſter bridge, at a conſiderable height above the water. One end of this wire communicated with the coating of a charged phial, the other being held by an obſerver, who, in his other hand, held an iron rod, which he dipped into the river. On the oppoſite ſide of the river ſtood a gentleman, who likewiſe dipped an iron rod in the river with one hand; and in the other held a wire, the extremity of which might be brought into contact with the wire of the phial.

Upon making the diſcharge, the ſhock was felt by the obſervers on both ſides the river, but more ſenſibly by thoſe who were ſtationed on the ſame ſide with the machine; part of the electric fire having gone from the wire down the moiſt ſtones of the bridge, thereby making ſeveral ſhorter circuits to the phial, but ſtill all paſſing through the gentlemen who were ſtationed on the ſame ſide with the machine. This was, in a manner, demonſtrated by ſome perſons feeling a ſenſible ſhock in their arms and feet, who only happened to touch the wire at the time of one of the diſcharges, when they were ſtanding upon the wet ſteps which led to the river. In one of the diſcharges made upon this occaſion, ſpirits were kindled by the fire which had gone through the river.

Upon this, and the ſubſequent occaſions, the gentlemen made uſe of wires in preference to chains; for this, among other reaſons, that the electricity which was conducted by chains was not ſo ſtrong as that which was conducted by wires. This, as they well obſerved, was occaſioned by the junctures of the links not being ſufficiently cloſe, as appeared by the ſnapping and flaſhing at every juncture where there was the leaſt ſeparation. Theſe leſſer ſnappings, being numerous in the whole length of a chain, very ſenſibly leſſened the great diſcharge at the gun-barrel.

Their next attempt was to force the electrical ſhock to make a circuit of two miles, at the New River at Stoke Newington. This they performed on the 24th of July 1747, at two places; at one of which the diſtance by land was 800 feet, and by water 2000: in the other, the diſtance by land was 2800 feet, and by water 8000. The diſpoſition of the apparatus was ſimilar to what they before uſed at Weſtminſter bridge, and the effect anſwered their utmoſt expectations. But as, in both caſes, the obſervers at both extremities of the chain, which terminated in the water, felt the ſhock as well when they ſtood with their rods fixed into the earth 20 feet from the water, as when they were put into the river; it occaſioned a doubt, whether the electric circuit was formed through the windings of the river, or a much ſhorter way, by the ground of the meadow: for the experiment plainly ſhowed, that the meadow-ground, with the graſs on it, conducted the electricity very well.

By ſubſequent experiments they were fully convinced, that the electricity had not in this caſe been conveyed by the water of the river, which was two miles in length, but by land, where the diſtance was only one mile; in which ſpace, however, the electric matter muſt neceſſarily have paſſed over the New River twice, have gone through ſeveral gravel pits, and a large ſtubble field.

July 28th, they repeated the experiment at the ſame place, with the following variation of circumſtances. The iron wire was, in its whole length, ſupported by dry ſticks, and the obſervers ſtood upon original electrics; the effect of which was, that they felt the ſhock much more ſenſibly than when the conducting wire had lain upon the ground, and when the obſervers had likewiſe ſtood upon the ground, as in the former experiment.

Afterwards, every thing elſe remaining as before, the obſervers were directed, inſtead of dipping their rods into the water, to put them into the ground, each 150 feet from the water. They were both ſmartly ſtruck, though they were diſtant from each other above 500 feet.

The ſame gentlemen, pleaſed with the ſucceſs of their former experiments, undertook another, the object of which was, to determine whether the electric virtue could be conveyed through dry ground; and, at the ſame time, to carry it through water to a greater diſtance than they had done before. For this purpoſe they pitched upon Highbury-barn beyond Iſlington, where they carried it into execution on the 5th of Auguſt 1747. They choſe a ſtation for their machine almoſt equally diſtant from two other ſtations for obſervers upon the New River; which were ſomewhat more than a mile aſunder by land and two miles by water. They had found the ſtreets of London, when dry, to conduct very ſtrongly for about 40 yards; and the dry road at Newington about the ſame diſtance. The event of this trial anſwered their expectations. The electric fire made the circuit of the water, when both the wires and the obſervers were ſupported upon original electrics, and the rods dipped into the river. They alſo both felt the ſhock, when one of the obſervers was placed in a dry gravelly pit, about 300 yards nearer the machine than the former ſtation, and 100 yards diſtant from the river: from which the gentlemen were ſatisfied, that the dry gravelly ground had conducted the electricity as ſtrongly as water.

From the ſhocks which the obſervers received in their bodies, when the electric power was conducted upon dry ſticks, they were of opinion, that, from the difference of diſtance ſimply conſidered, the force of the ſhock, as far as they had yet experienced, was very little if at all impaired. When the obſervers ſtood upon electrics, and touched the water or the ground with the iron rods, the ſhock was always felt in their arms or wriſts; when they ſtood upon the ground with their iron rods, they felt the ſhock in their elbows, wriſts, and ankles; and when they ſtood upon the ground without rods, the ſhock was always felt in the elbow and wriſt of that hand which held the conducting wire, and in both ankles.

The laſt attempt of this kind which theſe gentlemen made, and which required all their ſagacity and addreſs in the conduct of it, was to try whether the electric ſhock was perceptible at twice the diſtance to which they had before carried it, in ground perfectly dry, and where no water was near; and alſo to diſtinguiſh, if poſſible, the reſpective velocity of electricity and ſound.

For this purpoſe they fixed upon Shooter's-hill, and made their firſt experiments on the 14th of Auguſt 1747; a time when, as it happened, but one ſhower of rain had fallen during five preceding weeks. The wire communicating with the iron rod which made the diſcharge, was 6732 feet in length, and was ſupported all the way upon baked ſticks; as was alſo the wire which communicated with the coating of the phial, which was 3868 feet long, and the obſervers were diſtant from each other two miles. The reſult of the exploſion demonſtrated, to the ſatisfaction of the gentlemen preſent, that the circuit performed by the electric matter was four miles, *viz.* two miles of wire and two of dry ground, the ſpace between the extremities of the wires; a diſtance which, without trial, as they juſtly obſerved, was too great to be credited. A gun was diſcharged at the inſtant of the exploſion, and the obſervers had ſtop-watches in their hands, to note the moment when they felt the ſhock: but, as far as they could diſtinguiſh, the time in which the electric matter performed that vaſt circuit might have been inſtantaneous.

Miſcellaneous Experiments.

In all the exploſions where the circuit was made of conſiderable length, it was obſerved, that though the phial was very well charged, yet that the ſnap at the gun-barrel, made by the exploſion, was not near ſo loud as when the circuit was formed in a room; ſo that a by-ſtander, ſays Dr Watſon, though verſed in theſe operations, would not imagine, from ſeeing the flaſh, and hearing the report, that the ſtroke at the extremity of the conducting wire could have been conſiderable; the contrary whereof, when the wires were properly managed, he ſays, always happened.

Still the gentlemen, unwearied in theſe purſuits, were deſirous, if poſſible, to aſcertain the abſolute velocity of electricity at a certain diſtance; becauſe, though in the laſt experiment, the time of its progreſs was certainly very ſmall, if any, they were deſirous of knowing, ſmall as that time might be, whether it was meaſurable; and Dr Watſon had contrived an excellent method for that purpoſe.

Accordingly, on the 5th of Auguſt 1748, the gentlemen met once more, and the laſt time, at Shooter's-hill; when it was agreed to make an electric circuit of two miles, by ſeveral turnings of the wire in the ſame field. The middle of this circuit they contrived to be in the ſame room with the machine, where an obſerver took in each hand one of the extremities of the wires, each of which was a mile in length. In this excellent diſpoſition of the apparatus, in which the time between the exploſion and the ſhock might have been obſerved to the greateſt exactneſs, the phial was diſcharged ſeveral times; but the obſerver always felt himſelf ſhocked at the very inſtant of making the exploſion. Upon this the gentlemen were fully ſatisfied, that through the whole length of this wire, which was 12,276 feet, the velocity of the electric matter was inſtantaneous.

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Sometimes the fluid ſeems to move more ſlowly.

With all this ſurpriſing velocity, however, it is certain, that both ſides of a charged phial may be touched ſo quickly, even by the beſt conductors, that all the electric matter hath not time to make the circuit, and the phial will remain but half diſcharged. If the upper plate of an electrophorus alſo is very ſuddenly touched with the finger, or any other conductor, a very ſmall ſpark will be obtained on lifting it up; though a very ſtrong one would be got if the finger was kept longer upon it. But how this ſeeming ſlowneſs can be reconciled with the immeaſurable velocity above-mentioned, doth not appear. It is certain, indeed, that this fluid is conſiderably reſiſted in its paſſage through or over every ſubſtance. It will even prefer a ſhort paſſage in the air where it is violently reſiſted to one along a wire of very great length; but here, as in every other caſe, it ſeems to divide its force, and to break out through ſeveral different paſſages at once. A method of aſcertaining this hath been contrived by Dr Prieſtley, thus. Bend a wire, about five feet long, ſo that one part may come within half an inch of the other; then connect the extremities of the wire with the hook of the battery, and ſend a ſhock through it. On making the exploſion, a ſpark will be ſeen between the two parts which approach neareſt to each other; which ſhows that the fluid chooſes a ſhort paſſage through the air, rather than the long one through the wire. The charge, however, does not paſs entirely between theſe two parts, but ſome of it goes alſo thro' the wire. This may be proved by putting a ſlender wire

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between the two approaching parts: for, on making the diſcharge with only this addition in the apparatus, the ſmall wire will hardly be made red hot; whereas, if the large wire be cut ſo as to diſcontinue the circuit, the ſmall wire will be melted, and even exploded, by the ſame ſhock that before made it ſcarcely red hot. But though we can eaſily ſhow that the electric fluid always meets with reſiſtance, it is by no means eaſy to ſhow why the ſame reſiſtance which puts a temporary ſtop to its motions in ſome caſes, doth not ſo in all.

128 Water becomes electric by cold.

Another curious experiment in electricity is the converting of conducting ſubſtances into electrics by cold, and of changing electrics into conductors by heat. The firſt hath yet been done only in the inſtance of water. This is a diſcovery of Mr Achard's at Berlin, who, in the month of January 1776, obſerved, that water frozen to the 20th degree below the freezing point of Reaumur's thermometer, anſwering to the 13th below 0 of Fahrenheit's, is an electric. He tried his experiments in the open air, where he found, that a rod of ice two feet long and two inches thick, was a very imperfect conductor when Reaumur's thermometer was at ſix degrees below 0; and that it would not in the leaſt conduct when the thermometer was ſunk to 20°. By whirling a ſpheroid of ice in a proper machine, he even electrified the prime conductor ſo as to attract, repel, give ſparks, &c. The ice made uſe of was free from air-bubbles, and quite tranſparent; to produce which, he uſed to ſet a veſſel containing diſtilled water to be frozen, upon the window of a room which was rather warm with reſpect to the ambient air; ſo that the water began to freeze on the one ſide of the veſſel, while on the other it was ſtill liquid.

129 Electrics become conductors by heat.

To prove that glaſs and other electrics become conductors when very hot: Take a ſmall glaſs tube of about one twentieth of an inch in diameter, and above a foot long; cloſe it at one end, and introduce a wire into it, ſo that it may be extended through its whole length; let two or three inches of this wire project above the open end of the tube, and there faſten it with a bit of cork; tie round the cloſed end of the tube another wire, which will be ſeparated from the wire within the tube only by the glaſs interpoſed between them. In theſe circumſtances, endeavour to ſend a ſhock through the two wires, *i. e.* the wire inſerted in the glaſs tube and that tied on its outſide, by connecting one of them with the outſide, and touching the other with the knob of a charged jar; and you will find that the diſcharge cannot be made unleſs the tube be broken; becauſe the circuit is interrupted by the glaſs at the end of the tube, which is interpoſed between the two wires. But put that end of the tube to which the wire is tied into the fire, ſo that it may become juſt red-hot, then endeavour to diſcharge the jar again through the wires, and you will find that the exploſion will be eaſily tranſmitted from wire to wire through the ſubſtance of the glaſs, which, by being made red-hot, is become a conductor.

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In order to aſcertain the conducting quality of hot reſinous ſubſtances, oils, &c. bend a glaſs tube in the form of an arch *CFFD*, fig. 77. Plate CLXXVII; and tie a ſilk ſtring *GCD* to it, which ſerves to hold it by when it is to be ſet near the fire; fill the middle part of this tube with roſin, ſealing-wax, &c. then introduce two wires *AE*, *BF*, through its ends, ſo that they may touch the roſin, or penetrate a little way in it. This done, let a perſon hold the tube over a clear fire, ſo as to melt the roſin within it; at the ſame time, by connecting one of the wires *A* or *B* with the outſide of a charged jar, and touching the other with the knob of the jar, endeavour to make the diſcharge through the roſin, and you will obſerve, that while the roſin is cold, no ſhocks can be tranſmitted through it; but it becomes a conductor according as it melts; and when totally melted, then the ſhocks will paſs through it very freely.

To ſhow that hot air is a conductor, electrify one of the cork-ball electrometers ſuſpended upon the ſtand fig. 13. of Plate CLXXIV. or electrify the prime conductor with the quadrant electrometer; then bring a red-hot iron within a ſufficient diſtance of the electrometer or prime conductor, and you will find that they ſoon loſe their electricity, which is certainly conducted by the hot air contiguous to the iron; for if the experiment be repeated with the ſame iron when cold, *i. e.* by bringing it within the ſame diſtance of the electrified electrometer or prime conductor, their electricity will not be conducted away as before. It has been obſerved, that a battery may be diſcharged by introducing a red-hot iron between two knobs interpoſed, and ſtanding at ſome diſtance from each other in the circuit: but if, inſtead of iron, there be introduced a piece of red-hot glaſs between the knobs (the diſtance between them remaining as at firſt), the battery cannot be diſcharged: whence we may infer, that either hot air is not ſo good a conductor as has been imagined; or elſe, that air heated by iron is ſtronger with reſpect to its conducting power, than when heated by the red-hot glaſs.

130 Non-con ducting power o perfect v cuum.

The impoſſibility of forcing the electric fluid thro' a perfect vacuum, is a doctrine which militates ſo directly againſt the theory laid down in Sect. VI. that we cannot by any means omit a very full conſideration of it. As this, however, would lead us here into a theoretical diſquiſition, we ſhall not enter into any explanation in this place, but defer what is to be ſaid on that ſubject to the laſt ſection, where the uſes of the electric fluid in the ſyſtem of nature are conſidered. The experiment on which this ſuppoſition is founded, was originally made by Mr Walſh; who found that it was poſſible to cleanſe a barometrical tube ſo perfectly of air, that no electric light would be viſible in it upon agitating the mercury, as is the caſe with the common barometers. It has ſince been repeated to more advantage by Mr William Morgan, who from his obſervations has deduced ſome concluſions concerning the action of the electric fluid very inconſiſtent with that extenſive operation which many philoſophers have aſcribed to it, and which is aſcribed to it in various articles of this work. His experiment is publiſhed in the Phil. Tranſ. for 1785, which we ſhall here extract.

131 Mr Mo riment this ſubj

" The non-conducting power of a perfect vacuum, is a fact in electricity which has been much controverted among philoſophers. The experiments made by Mr Walſh, F. R. S. in the double barometer tube clearly demonſtrated the impermeability of the electric light through a vacuum; nor was it, I think, precipitate to to conclude from them the impermeability of the electric fluid itſelf. But this concluſion has not been univerſally admitted; and the following experiments were made with the view of determining its truth or fallacy. When I firſt attended to the ſubject, I was not aware that any other attempts had been made beſides thoſe of Mr Walſh; and though I have ſince found myſelf to have been in part anticipated in one of my experiments, it may not perhaps be improper to give ſome account of them, not only as they are an additional teſtimony in ſupport of this fact, but as they led to the obſervation of ſome phenomena which appear to be new and intereſting.

“ A mercurial gage *B*, about 15 inches long, carefully and accurately boiled till every particle of air was expelled from the inſide, was coated with tin-foil five inches down from its ſealed end *A*, and being inverted into mercury thro' a perforation *D*, in the braſs cap *E*, which covered the mouth of the ciſtern *H*, the whole was cemented together, and the air was exhauſted from the inſide of the ciſtern thro' a valve *C* in the braſs cap *E* juſt mentioned; which producing a perfect vacuum in the gage, afforded an inſtrument peculiarly well adapted for experiments of this kind. Things being thus adjuſted, (a ſmall wire *F* having been previouſly fixed on the inſide of the ciſtern to form a communication between the braſs cap *E* and the mercury *G*, into which the gage was inverted), the coated end was applied to the conductor of an electrical machine; and notwithſtanding every effort, neither the ſmalleſt ray of light, nor the ſlighteſt charge, could ever be procured in this exhauſted gage. I need not obſerve, that if the vacuum on its inſide had been a conductor of electricity, the latter at leaſt muſt have taken place; for it is well known, that if a glaſs tube be exhauſted by an air-pump, and coated on the outſide, both light and a charge may very readily be procured. If the mercury in the gage be imperfectly boiled, the experiment will not ſucceed; but the colour of the electric light, which, in air rarefied by an exhauſter, is always violet or purple, appears in this caſe of a beautiful green; and what is very curious, the degree of the air's rarefaction may be nearly determined by this means: for I have known inſtances, during the courſe of theſe experiments, where a ſmall particle of air having found its way into the tube *B*, the electric light became viſible, and as uſual of a green colour; but the charge being often repeated, the gage has at length cracked at its ſealed end, and in conſequence the external air, by being admitted into the inſide, has gradually produced a change in the electric light from green to blue, from blue to indigo, and ſo on to violet and purple, till the medium has at laſt become ſo denſe as no longer to be a conductor of electricity. I think there can be little doubt from the above experiments, of the non-conducting power of a perfect vacuum; and this fact is ſtill more ſtrongly confirmed by the phenomena which appear upon the admiſſion of a very minute particle of air into the inſide of the gage. In this caſe the whole becomes immediately luminous upon the ſlighteſt application of electricity, and a charge takes place, which continues to grow more and more powerful in proportion as freſh air is admitted, till the denſity of the conducting medium arrives at its maximum, which it always does when the colour of the electric light is indigo or violet. Under theſe circumſtances the charge may be ſo far increaſed as frequently to break the glaſs. In ſome tubes, which have not been completely boiled, I have obſerved that they will not conduct the electric fluid when the mercury is fallen very low in them; yet upon letting in air into the ciſtern, ſo that the mercury ſhall riſe in the gage, the electric fluid, which was before latent in the inſide, ſhall now become viſible; and as the mercury continues to riſe, and of conſequence the medium is rendered leſs rare, the light ſhall grow more and more viſible, and the gage ſhall at laſt be charged, notwithſtanding it has not been near an electrical machine for two or three days. This ſeems to prove, that there is a limit even in the rarefaction of air, which ſets bounds to its conducting power; or, in other words, that the particles of air may be ſo far ſeparated from each other as no longer to be able to tranſmit the electric fluid; that if they are brought within a certain diſtance of each other, their conducting power begins, and continually increaſes till their approach alſo arrives at its limit, when the particles again become ſo near as to reſiſt the paſſage of the fluid entirely, without employing violence, which is the caſe in common and condenſed air, but more particularly in the latter.

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Surpriſing eaſe with which an exhauſted tube is charged with electricity.

“ It is ſurpriſing to obſerve how readily an exhauſted tube is charged with electricity. By placing it at 10 or 12 inches from the conductor, the light may be ſeen pervading its inſide, and as ſtrong a charge may ſometimes be procured as if it were in contact with the conductor: nor does it ſignify how narrow the bore of the glaſs may be; for even a thermometer tube, having the minuteſt perforation poſſible, will charge with the utmoſt facility; and in this experiment the phenomena are peculiarly beautiful.

“ Let one end of a thermometer tube be ſealed hermetically; let the other end be cemented into a braſs cap with a valve, or into a braſs cock, ſo that it may be fitted to the plate of an air-pump. When it is exhauſted, let the ſealed end be applied to the conductor of an electrical machine, while the other end is either held in the hand or connected to the floor. Upon the ſlighteſt excitation the electric fluid will accumulate at the ſealed end, and be diſcharged through the inſide in the form of a ſpark, and this accumulation and diſcharge may be inceſſantly repeated till the tube is broken. By this means I have had a ſpark 42 inches long; and had I been provided with a proper tube, I do not doubt but that I might have had a ſpark of four times that length. If, inſtead of the ſealed end, a bulb be blown at that extremity of the tube, the electric light will fill the whole of that bulb, and then paſs through the tube in the form of a brilliant ſpark, as in the foregoing experiment: but in this caſe I have ſeldom been able to repeat the trials above three or four times before the charge has made a ſmall perforation in the bulb. If, again, a thermometer filled with mercury be inverted into a ciſtern, and the air exhauſted in the manner I have deſcribed for making the experiment with the gage, a Torricellian vacuum will be produced; and now the electric light in the bulb, as well as the ſpark in the tube, will be of a vivid green; but the bulb will not bear a frequent repetition of charges before it is perforated in like manner as when it has been exhauſted by an air pump. It can hardly

134
Tube perforated by the electric ſpark.

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be neceſſary to obſerve, that in theſe caſes the electric fluid aſſumes the appearance of a ſpark (D), from the narrowneſs of the paſſage through which it forces its way. If a tube 40 inches long be fixed into a globe 8 or 9 inches in diameter, and the whole be exhauſted, the electric fluid, after paſſing in the form of a brilliant ſpark throughout the length of the tube, will, when it gets into the inſide of the globe, expand itſelf in all directions, entirely filling it with a violet and purple light, and exhibiting a ſtriking inſtance of the vaſt elaſticity of the electric fluid. 135 Why the fluid aſſumes the form of a ſpark.

"I cannot conclude this paper without acknowledging my obligations to the ingenious Mr Brook of Norwich, who by communicating to me his method of boiling mercury, has been the chief cauſe of my ſucceſs in theſe experiments (E). I have lately learned from him, that he has alſo aſcertained the non-conducting power of a perfect vacuum; but what ſteps he took for that purpoſe, I know not. Of his accuracy, however, I am ſo well convinced, that had I never made an experiment myſelf, I ſhould, upon his teſtimony alone, have been equally aſſured of the fact. To moſt of the preceding experiments Dr Price, Mr Lane, and ſome others of my friends, have been eye-witneſſes; and I believe that they were as thoroughly ſatisfied as myſelf with the reſults of them. I muſt beg leave to obſerve to thoſe who wiſh to repeat them, that the firſt experiment requires ſome nicety, and no inconſiderable degree of labour and patience. I have boiled many gages for ſeveral hours together without ſucceſs, and was for ſome time diſpoſed to believe the contrary of what I am now convinced to be the truth. Indeed, if we reaſon *à priori*, I think we cannot ſuppoſe a perfect vacuum to be a perfect conductor without ſuppoſing an abſurdity: for if this were the caſe, either our atmoſphere muſt have long ago been deprived of all its electric fluid, by being every where ſurrounded by a boundleſs conductor, or this fluid muſt pervade every part of infinite ſpace; and conſequently there can be no ſuch thing as a perfect vacuum in the univerſe. If, on the contrary, the truth of the preceding experiments be admitted, it will follow, that the conducting power of our atmoſphere increaſes only to a certain height, beyond which this power begins to diminiſh, till at laſt it entirely vaniſhes; but in what part of the upper regions of the air theſe limits are placed, I will not preſume to determine. It would not perhaps have been difficult to have applied the reſults of ſome of theſe experiments to the explanation of meteors, which are probably owing to an accumulation of electricity. It is not, however, my preſent deſign to give looſe to my imagination. I am ſenſible, that by indulging it too freely, much harm is done to real knowledge; and therefore, that one fact in philoſophy well aſcertained, is more to be valued than whole volumes of ſpeculative hypotheſes."

136 Great difficulty in making this experiment.

137 Electric fluid ſuppoſed not to reach beyond the atmoſphere of the earth.

Miſcella- neou perime

A fact ſo contrary to the generally received opinion of the conducting powers of a vacuum, could not but excite a general ſurpriſe, and attempts to repeat the experiment would no doubt be ardently wiſhed for Unfortunately, however, the experiment itſelf, as muſt evidently appear from the account given of it by Mr Morgan, is of ſuch a precarious nature, as muſt undoubtedly diſcourage any ordinary electrician from attempting it; for in the firſt place, there is no hope of ſucceſs without a very tedious boiling of mercury in a tube for ſeveral hours; and even when this is done, the inſtrument will not remain in a ſtate of perfection for any length of time. Mr Cavallo, who has greatly improved the air-pump, gives an account of ſome very curious experiments made with this inſtrument, in order to aſcertain the truth of Mr Morgan's poſition; which we ſhall likewiſe give in his own words, with the concluſions he draws from them.

13 Cavall experi ment an impr ved air pump.

"I. In a glaſs receiver, of ſix inches diameter and nine inches in height, having a braſs cap, a braſs wire of two-tenths of an inch in diameter was fixed to its cap, and proceeding through the middle of the receiver, its lower extremity was five inches diſtant from the aperture of the receiver, and of courſe of the plate of

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(D) "By cementing the ſtring of a guittar into one end of a thermometer tube, a ſpark may be obtained as well as if the tube had been ſealed hermetically."

(E) "Mr Brook's method of making mercurial gages is nearly as follows: Let a glaſs tube *L*, (fig. 81.) ſealed hermetically at one end, be bent into a right angle within two or three inches of the other end. At the diſtance of about an inch or leſs from the angle, let a bulb *K*, of about $\frac{3}{4}$ths of an inch in diameter, be blown in the curved end, and let the remainder of this part of the tube be drawn out *I*, ſo as to be ſufficiently long to take hold of when the mercury is boiling. The bulb *K* is deſigned as a receptacle for the mercury, to prevent its boiling over; and the bent figure of the tube is adapted for its inverſion into the ciſtern: for by breaking off the tube at *M* within $\frac{1}{8}$th or $\frac{1}{4}$th of an inch of the angle, the open end of the gage may be held perpendicular to the horizon when it is dipped into the mercury in the ciſtern, without obliging us to bring our finger or any other ſubſtance into contact with the mercury in the gage, which never fails to render the inſtrument imperfect. It is neceſſary to obſerve, that if the tube be 14 or 15 inches long, I have never been able to boil it effectually for the experiments mentioned in this paper in leſs than three or four hours, although Mr Brook ſeems to preſcribe a much ſhorter time for the purpoſe; nor will it even then ſucceed, unleſs the greateſt attention be paid that no bubbles of air lurk behind, which to my own mortification I have frequently found to have been the caſe: but experience has at length taught me to guard pretty well againſt this diſappointment, particularly by taking care that the tube be completely dry before the mercury is put into it; for if this caution be not obſerved, the inſtrument can never be made perfect. There is, however, one evil which I have not yet been able to remedy; and that is, the introduction of air into the gage, owing to the unboiled mercury in the ciſtern: for when the gage has been a few times exhauſted, the mercury which originally filled it becomes mixed with that into which it is inverted, and in conſequence the vacuum is rendered leſs and leſs perfect, till at laſt the inſtrument is entirely ſpoiled. I have juſt conſtructed a gage ſo as to be able to boil the mercury in the ciſtern, but have not yet aſcertained its ſucceſs."

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of the air-pump, when the receiver was placed upon it. A fine linen thread was faſtened towards the top of the wire, and about four inches of it hanged freely along the braſs wire, and almoſt in contact with it. The extremity of the wire, which paſſing through the braſs cap projected out of the receiver, was furniſhed with a ball. Thus prepared, the receiver was placed upon the plate of the pump, without any leather, or any thing elſe beſides a little oil on its outſide edge, which muſt be always underſtood in all the other experiments related in the courſe of this chapter. Then the exhauſtion was commenced, and at intervals ſome electricity was communicated, either by the approach of the conductor of an electrical machine, or the knob of a charged jar, to the braſs ball of the wire, in order to obſerve the ſtrength of the repulſion of the thread from the wire in different degrees of rarefaction; which degrees were aſcertained by the ſhort barometrical gage. Proceeding in this manner, it was obſerved, that till the rarefaction did not exceed one hundred, to wit, till the air remaining within the receiver was not leſs than the hundredth part of the original quantity, whenever the electricity was communicated to the braſs ball, the thread firſt adhered to the wire, and then was repelled by it; though this repulſion became ſmaller and ſmaller, according as the exhauſtion came nearer to the above mentioned degree. The clinging of the thread to the wire firſt, was becauſe being dry, it required ſome time before it acquired a ſufficient quantity of electricity from the wire, and conſequently it was not immediately repelled. When the air within the receiver was exhauſted above 100 times, the thread was not firſt attracted and then repelled as before, but only vibrated a little backwards and forwards, and then remained in the ſituation in which it ſtood when electricity was not concerned. By exhauſting the receiver ſtill farther, the vibration of the thread when electrified was gradually diminiſhed; ſo that when the degree of rarefaction was above 500, ſparks and the diſcharge of a jar only made the thread vibrate in a manner juſt ſenſible; but this vibration, however ſmall, did never become quite inſenſible, even when the receiver was exhauſted to the utmoſt power of the pump, which was very near 1000. After this the air was gradually admitted into the receiver, and at various intervals the ball of the braſs wire was electrified, in order to obſerve whether the ſame phenomena appeared at the different degrees of exhauſtion as had done before; and they were found to agree with ſufficient exactneſs.

"II. The braſs wire within the ſame glaſs receiver was made very ſhort, and from its extremity a fine linen thread, fixes inches long, was ſuſpended; and upon the plate of the pump a ſmall braſs ſtand with a braſs pillar was placed: ſo that when the receiver was put upon the plate, and over the braſs ſtand, about one inch length of the thread ſtood parallel to, and at various required diſtances from, the braſs pillar (F). In this diſpoſition of the apparatus, whenever any the leaſt quantity of electricity was communicated to the knob of the braſs wire, the thread was immediately attracted by the braſs pillar, and adhered to it ſome time, becauſe, being dry, it did not immediately part with the acquired electricity. At various degrees of exhauſtion, the electricity being communicated to the braſs ball of the wire, it was found, that the thread was always attracted by the braſs pillar, though from a greater or leſs diſtance, according as a greater or leſs quantity remained within the receiver. Thus when the air was rarefied about 100 times, the thread was attracted from about one inch; when the air was rarefied 200 times, it was attracted from about $\frac{1}{8}$th of an inch; when the air was rarefied 300 times, it was attracted from about $\frac{1}{10}$th; and after this it was always attracted from about $\frac{1}{20}$th, even when the air within the receiver was rarefied about 1000 times. It is remarkable, that when the air in the receiver is rarefied about 300 times, if a jar is diſcharged thro' the vacuum, by touching its knob with the ball of the wire on the receiver, the thread is not in conſequence of it attracted by the braſs pillar: the reaſon of which ſeems to be, becauſe that large quantity of electricity opens a way thro' the vacuum, and paſſes thro' every part of it; whereas a ſmall quantity of electricity, even the action of a ſmall electrical machine in the ſame room, at no very great diſtance from the apparatus, will cauſe the thread being attracted by the braſs pillar.

Miſcellaneous Experiments.

III. "The braſs ſtand, with the pillar, and the thread which proceeded from the wire, being removed from under the receiver, a very ſenſible electrometer was faſtened, inſtead of the thread, to the extremity of the braſs wire. This electrometer conſiſted of two very fine ſilver wires, each about one inch long, and having a ſmall cone of cork at its extremity. The ſenſibility of ſuch an electrometer is really ſurpriſing; for even the electricity of a ſingle hair excited, does ſenſibly affect it; and, as its ſuſpenſion is almoſt without any friction or other impediment, it never deceives one by appearing to be electrified when in reality it is not ſo. With this preparation, the receiver being placed upon the plate of the air-pump, the air was gradually exhauſted, and at intervals ſome electricity was communicated to the ball on the outſide of the receiver, either by an excited electric or by a charged jar; and it was found that the corks of the electrometer were always made to diverge by it, even when the air was exhauſted as much as poſſible. Indeed their divergency was ſmaller and ſmaller, and laſted a ſhorter time, according as the air was more exhauſted, but it was viſible to the laſt.

"In this experiment, analogous to what has been obſerved in the preceding, when the air was exhauſted above 300 times, if a jar was diſcharged through the vacuum, or a ſtrong ſpark was given to the knob on the top of the receiver, the corks of the electrometer diverged very little indeed, and but for an inſtant; whereas a ſmall quantity of electricity made them diverge more, and remain much longer in that ſtate.

139
His concluſions from them.

"It ſeems deducible from thoſe experiments, that electric attraction and repulſion take place in every degree of rarefaction, from the loweſt to about 1000, but that the power diminiſhes in proportion as the air

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(F) This diſtance was altered by turning the braſs wire which paſſed through a collar of leather in the braſs cap of the receiver.

Miſcellaneous Experiments

air is more and more rarefied; and by following the law, we may perhaps conclude with F. Beccaria, that there is no electric attraction nor repulſion in a perfect vacuum: though this will perhaps be impoſſible to be verified experimentally; becauſe when in an exhauſted receiver no attraction or repulſion is obſerved between bodies to which electricity is communicated, it will be only ſuſpected, that thoſe bodies are not ſufficiently ſmall and light. But if we conſult reaſon, and which alone ought to aſſiſt us when deciſive experiments are not practicable, it ſeems likely that electric attraction and repulſion cannot take place in a perfect vacuum, by which I only mean a perfect abſence of air; becauſe either this vacuum is a conductor or a non-conductor of electricity. If a conductor, and nearer to perfection as it becomes more free from air, it muſt be a perfect conductor at the ſame time that it becomes a perfect vacuum; in which caſe electric attraction or repulſion cannot take place amongſt bodies incloſed in it: for, according to every notion we have of electricity, thoſe motions indicate or are the conſequence of the intervening ſpace in ſome meaſure obſtructing the free paſſage of the electric fluid. And if the perfect vacuum is a perfect non-conductor, then neither electric attraction nor repulſion can happen in it.

140 Electric light always viſible in the moſt perfectly exhauſted receiver.

"IV. In my former experiments, having always obſerved the electric light in the receiver of the air-pump, even when the air was rarefied to the utmoſt power of that machine, I thought proper to repeat that experiment with receivers of various ſizes; and accordingly have uſed receivers of above two feet in height, and ſome of as large a diameter as the plate of the pump could admit, which is about 14 inches; but the light in it was always viſible, only with different colours in different degrees of exhauſtion, and always more diffuſed, and at the ſame time leſs denſe, when the air was more rarefied; which ſeems to render it probable, that when the air is quite removed from any ſpace, the electric light is no longer viſible in it, as muſt have been the caſe with the experiment of Mr Walſh's double barometer; for it is a maxim very well eſtabliſhed in electricity, that the electric light is only viſible when the electric fluid, in paſſing from one body to another, meets with ſome oppoſition in its way; and according to this propoſition, when the air is entirely removed from a given receiver, the electric fluid paſſing through that receiver cannot ſhow any light, becauſe it meets with no oppoſition; but this will not account for the receiver ever becoming a non-conductor.

"Having juſt mentioned, that according as the air is more and more rarefied in a receiver, ſo the electric light becomes gradually more faint, it will be proper to add, that the electric light is more diffuſed and leſs bright in an exhauſted receiver than in air: Thus, when the receiver is not exhauſted, the diſcharge of a jar through ſome part of it will appear like a ſmall globule exceedingly bright; but when the receiver is exhauſted, the diſcharge of the ſame jar will fill the whole receiver with a very faint light: whereas ſome perſons, by ſeeing the whole receiver illuminated, are apt to ſay that the light of electricity is rendered ſtronger and greater by the exhauſtion.

"V. It is mentioned by Mr Nairne, in the 67th vol. of the Phil. Tranſ. that having put a piece of leather, juſt as it comes from the leather-ſellers, into the receiver of an air pump, and afterwards having rarefied the air in it 148 times, the electric light appeared very faint in it; whereas, without the leather, and even when the air was much more rarefied, the light of the electric fluid, when made to paſs through the receiver, was much more apparent. In conſequence of this obſervation, I ſuſpected that a little moiſture in the receiver, or ſome other effluvia of ſubſtances, might perhaps prevent the appearance of the electric light in rarefied air; and with this view I began to put various ſubſtances ſucceſſively into the receiver; and after rarefying the air by working the pump, ſome electric fluid was made to paſs through the receiver.

141 Experiments by introducing various ſubſtances into the receiver.

"When a piece of moiſt leather was put into the receiver, the air could not be rarefied above 100 times, and the electric light appeared divided into a great many branches; though at the ſame time another ſort of faint light filled up the whole cavity of the receiver.

"When a linen rag, moiſtened with a mixture of ſpirit of wine and water, was put into the receiver, the pump could not exhauſt above 40 times, and the light of electricity appeared divided into many branches.

"A wine-glaſs full of olive oil placed under the receiver, prevented very little the exhauſtion of the pump, the air being rarefied above 400 times. The electric light appeared exactly as it uſually does in the ſame degree of rarefaction when no oil is under the receiver, *viz.* a uniform faint light inclining to purple or red.

"Concentrated vitriolic acid placed in a glaſs under the receiver, produced no particular effect. As for the other mineral acids, they were not tried, becauſe, being volatile, they would have damaged the pump.

"Dry ſolids, that had a conſiderable ſmell, as ſulphur, aromatic woods previouſly made very dry, and ſome reſins, produced no particular effect, any more than ſome of them prevented a very great degree of exhauſtion, owing to ſome moiſture which ſtill adhered to them.

142 The light attraction and repulſion, diminiſh in great degree of rarefaction.

"From theſe experiments it appears, firſt, that in the utmoſt rarefaction that can be effected by the beſt air-pump, which amounts to about 1000, both the electric light and the electric attraction, though very weak, are ſtill obſervable: but, ſecondly, that the attraction and repulſion of electricity become weaker in proportion as the air is more rarefied, and in the ſame manner the intenſity of the light is gradually diminiſhed. Now by reaſoning on this analogy we may conclude, that both the attraction and the light will ceaſe in a perfect abſence of air: but this will never account for this perfect vacuum ever becoming a non-conductor of electricity; for ſince the electric fluid is very elaſtic, and expands itſelf with more and more freedom in proportion as the reſiſtance of the air is removed, it ſeems unnatural that it ſhould be incapable of pervading a perfect vacuum: however, the fact ſeems to be fully aſcertained by Mr Walſh and Mr Morgan; and the only thing that remains to be done is to inveſtigate the cauſe of ſo remarkable a property."

With

Miſcellaneous Experiments.

With regard to the power of the electric fluid, we have already had occaſion to ſpeak in various parts of this treatiſe, and particularly to mention the machine in Teyler's Muſeum at Haarlem, as that which was capable of accumulating the greateſt quantity of electricity that had ever been done artificially. Some of the effects of this machine, without any battery, have already been deſcribed; and thoſe which follow are equally calculated to give an idea of its vaſt power. A battery of 135 vials, containing among them about 130 ſquare feet of coated ſurface, was charged by about 100 turns of the glaſs plates; the diſcharge of which melted an iron wire 15 feet long and $\frac{1}{151}$ of an inch diameter; and another time they melted a wire of the ſame metal 25 feet long and $\frac{1}{235}$th of an inch in diameter. With ſuch an extraordinary power they tried to give polarity to needles made out of watch-ſprings of three and even ſix inches in length, and likewiſe to ſteel bars nine inches long, from a quarter to half an inch in breadth, and about the twelfth-part of an inch in thickneſs. The reſult was, that when the bar or needle was placed horizontally in the magnetic meridian, whichever way the ſhock entered, the end of the bar that ſtood towards the north acquired the north polarity, or the power of turning towards the north when freely ſuſpended, and the oppoſite end acquired the ſouth. If the bar, before it received the ſhock, had ſome polarity, and was placed with its poles contrary to the uſual direction, then its natural polarity was always diminiſhed, and often reverſed; ſo that the extremity of it, which in receiving the ſhock looked towards the north, became the north pole, &c.

When the bar or needle was ſtruck ſtanding perpendicularly, its loweſt end became the north pole in any caſe, even when the bar had ſome magnetiſm before, and was placed with the ſouth pole downwards. All other circumſtances being alike, the bars ſeemed to acquire an equal degree of magnetic power, whether they were ſtruck whilſt ſtanding horizontally in the magnetic meridian, or perpendicular to the horizon.

When a bar or needle was placed in the magnetic equator, whichever way the ſhock entered, it never gave it any magnetiſm; but if the ſhock was given through its width, then the needle acquired a conſiderable degree of magnetiſm, and the end of it which lay towards the weſt became the north pole, and the other end the ſouth pole.

If a needle or bar, already magnetic, or a real magnet, was ſtruck in any direction, its power was always diminiſhed. For this experiment, they tried conſiderably large bars; one being 7,08 inches long, 0,26 broad, and 0,05 thick.

When the ſhock was ſo ſtrong, in proportion to the ſize of the needle, as to render it hot, then the needle generally acquired no magnetiſm at all, or very little.

The experiments laſtly tried with this very powerful battery were concerning the calcination of metallic ſubſtances, and the revivification of their calces. It appears that the electric ſhock produced both theſe apparently contradictory effects.

The metallic calces uſed in thoſe experiments were of the pureſt ſort; they were confined between glaſſes whilſt the ſhock was paſſed over them. By this means the calces were ſo far revivified as to exhibit ſeveral grains of the metal, large enough to be diſcerned by the naked eye, and to be eaſily ſeparated from the reſt.

As to the calcination of metals, whenever a ſhock was employed much greater than that which was neceſſary to fuſe the metal, part of the metal was calcined, and diſperſed into ſmoke. It is remarkable, that this calcination or ſmoke generally produced ſeveral filaments, of various lengths and thickneſſes, which ſwam in the air. It was farther obſerved, that thoſe flying filaments of metallic calx, if a conductor was preſented to them, were ſoon attracted by it; but after the firſt contact, they were inſtantly repelled, and generally broke into diverſe parts.

144
The battery augmented.

Even this vaſt power was not the utmoſt effect of the machine. Dr Van Marum, whom we have already mentioned as principally concerned in making the experiments, thinking that it was capable of charging a larger ſurface, added to it 90 jars, each of the ſame ſize with the former; ſo that his grand battery is now a ſquare of 15 jars every way, and contains 225 ſquare feet of coated glaſs. To aſcertain the degree of the charge, he uſes the electrometer invented by Mr Brook, to be afterwards deſcribed, which is fixed in the centre of the battery, at the height of four feet above the knobs of the jars.

His firſt object was to try whether this battery could be fully charged by the machine, and whether its increaſe of power was proportional to the augmentation of its ſurface. In theſe reſpects, his expectations were fully anſwered. The former battery diſcharged itſelf over the uncoated part of the jars after 96 revolutions; and the preſent did the ſame after 160 turns of the machine. With the former battery, the Doctor had ſplit a cylinder of box three inches in diameter and three inches in length, the ſection of which, through its axis, contained nine ſquare inches. With the 225 jars, he ſplit a ſimilar cylinder, four inches in diameter and four inches in height, the ſection of which was 16 ſquare inches. He found that to ſplit a ſquare inch of this wood in the ſame direction, required a force equal to 615 pounds; and hence calculates that the power of this exploſion was not leſs than 9840 pounds.

145
Calculation of the force of its exploſion.

146
Lengths of wire of different kinds melted by it.

The apparent reſemblance between the effects of electricity and of fire, eſpecially in melting metals, has led many to ſuppoſe that they act upon bodies in a ſimilar manner. In order to examine whether this ſuppoſition be juſt, Dr Van Marum cauſed wires of different metals to be drawn through the ſame hole, of one thirty-eighth part of an inch in diameter, and obſerved how many inches of each could be melted by the exploſion of his battery; taking care, in all theſe experiments, to charge it to the ſame degree as aſcertained by his electrometer. The reſults were as follow:

| | | |
|---|---|---|
| Of lead he melted | - | 120 inches. |
| Of tin | - - | 120 |
| Of iron | - - | 5 |
| Of gold | - - | 3½ |

Of ſilver, copper, and braſs, not quite a quarter of an inch.

Theſe ſeveral lengths of wire, of the ſame diameter, melted by equal exploſions, indicate, according to our author, the degree in which each metal is fuſible by the

the electrical diſcharge; and if theſe be compared with the fuſibility of the ſame metals by fire, a very conſiderable difference will be obſerved. According to the experiments of the academicians of Dijon, to melt tin required a heat of 172 degrees of Reaumur's thermometer.

| | |
|---|---|
| Lead | 230 |
| Silver | 430 |
| Gold | 563 |
| Copper | 630 |
| Iron | 696 |

147
Electrical fluid ſuppoſed to act in a different manner from fire.

Thus tin and lead appear to be equally fuſible by electricity, but not by fire: and iron, which by fire is leſs fuſible than gold, is much more ſo by the electrical exploſion. From theſe and ſome other experiments of the ſame kind, Dr Van Marum concludes, that, in melting metals, the electrical fluid acts upon them in a manner very different from the action of fire, and that the ſuppoſed analogy between theſe two powerful agents cannot be proved, either from the fuſion of metals, or the ignition of combuſtible ſubſtances.

148
Comparative efficacy of the different metals as conductors

By theſe experiments on the fuſibility of metals, Dr Van Marum was induced to make trial of the comparative efficacy of lead, iron, braſs, and copper, as conductors to preſerve buildings from lightning. In this reſpect, he found that a leaden conductor ought to be four times the ſize of one of iron, in order to be equal in point of ſafety. He has alſo fully proved the ſuperiority of rods to chains, and of copper to iron, for this important uſe.

When iron wire is melted by the exploſion of the battery, the red-hot globules are thrown to a very conſiderable diſtance, ſometimes to that of 30 feet: this the Doctor juſtly aſcribes to the lateral force exerted by the electrical fluid. It is, however, remarkable, that the thicker the wire is which is melted, the further are the globules diſperſed: but this is accounted for, by obſerving, that the globules, formed by the fuſion of thinner wires, being ſmaller, are leſs able to overcome the reſiſtance of the air, and are therefore ſooner ſtopped in their motion.

Two pieces of iron wire being tied together, the fuſion extended no further than from the end connected with the inſide coating of the jars to the knot; tho' wire of the ſame length and thickneſs, when in one continued piece, had been entirely melted by an equal exploſion.

149
Wires ſhortened by the diſcharge.

When a wire was too long to be melted by the diſcharge of the battery, it was ſometimes broken into ſeveral pieces, the extremities of which bore evident marks of fuſion; and the effect of electricity in ſhortening wire was very ſenſible in an experiment made with 18 inches of iron wire $\frac{1}{37}$th of an inch in diameter, which, by one diſcharge, loſt a quarter of an inch of its length.

150
Very ſmall wires cannot diſcharge the battery entirely.

An exploſion of this battery through very ſmall wires, of nearly the greateſt length that could be melted by it, did not entirely diſcharge the jars. On tranſmitting the charge through 50 feet of iron wire of $\frac{1}{40}$th of an inch diameter, the Doctor found that the reſiduum was ſufficient to melt two feet of the ſame wire; but this reſiduum was much leſs when the wire was of too great a length to be melted by the firſt diſcharge. After an exploſion of the battery through 180 feet of iron wire, of equal diameter with the former, the reſiduum was diſcharged through 12 inches of the ſame wire, which it did not melt, but only blued.

Twenty-four inches of leaden wire $\frac{1}{18}$th of an inch in diameter, were entirely calcined by an exploſion of this battery; the greater part of the lead roſe in a thick ſmoke, the remainder was ſtruck down upon a paper laid beneath it, where it formed a ſtain, which reſembled the painting of a very dark cloud. When ſhorter wires were calcined, the colours were more varied. A plate is given of the ſtain made by the calcination of eight inches of this wire, in which the cloud appears variouſly ſhaded with different tints of green, gray, and brown, in a manner of which no deſcription can give an adequate idea.

151
Curious phenom
wi h tin
wire

On diſcharging the battery through eight inches of tin wire $\frac{1}{38}$th of an inch diameter, extended over a ſheet of paper, a thick cloud of blue ſmoke aroſe, in which many calcareous filaments were diſcernible; at the ſame time a great number of red hot globules of tin, falling upon the paper, were repeatedly thrown up again into the air, and continued thus to rebound from its ſurface for ſeveral ſeconds. The paper was marked with a yellowiſh clouded ſtain immediately under the wire, and with ſtreaks or rays of the ſame colour iſſuing from it in every direction: ſome of theſe formed an uninterrupted line, others were made up of ſeparate ſpots. In order to be certain that the colour of theſe ſtreaks was not cauſed by the paper being ſcorched, the experiment was ſeveral times repeated, when a plate of glaſs and a board covered with tin were placed to receive the globules. Theſe, however, were ſtained exactly like the paper. On calcining five inches of the ſame kind of wire, the red-hot globules were thrown obliquely to the height of four feet, which afforded an opportunity of obſerving that each globule, in its courſe, diffuſed a matter like ſmoke, which continued to appear for a little while in the parabolic line deſcribed by its flight, forming a track in the air of about half an inch in breadth.

152
Account for.

From this phenomenon, Dr Van Marum conjectures, that when the globules approach the paper on which they fall, the matter iſſuing from their lower part ſtrikes againſt its ſurface, and being elaſtic, forces them upwards again by its reaction. The clouded ſtain immediately under the wire, the Doctor attributes to the inſtantaneous calcination of its ſurface; whereas the remainder of the metal is melted into globules, which, while they retain their glowing heat, continue to be ſuperficially calcined, and, during the proceſs, part with this calcareous vapour.

153
With w
compoſe
of equal
parts of
tin and
lead.

Phenomena ſomething ſimilar to the above were obſerved on the calcination of a wire of equal parts of tin and lead, eight inches long, and $\frac{1}{32}$d of an inch in diameter. This alſo was melted into red globules, which were repeatedly driven upwards again from the paper on which they fell, and marked it with ſtreaks of the ſame kind, but of a brown colour, edged with a yellow tinge. Some of theſe globules, though apparently not leſs hot, moved with leſs velocity than others, and were ſoon ſtopped in their courſe by their burning a hole in the paper. In this caſe, a yellow matter was ſeen to riſe from their ſurface to the height of one or two lines, which extended itſelf to the width of a quarter of an inch. This matter continued, during

five

ella- ·Ex- ients.

five or ſix ſeconds, to iſſue from the globules, and formed, on their ſurface, a kind of efflorescence, reſembling the flowers of ſulphur produced by the *ſolfaterra*. The globules, from which theſe calcareous flowers had iſſued, were found to be entirely hollow, and to conſiſt of only a thin ſhell. When this mixed metal is calcined with a leſs charge of the battery, it leaves a ſtain upon the paper, ſomething ſimilar to that made by lead, and does not run into globules.

4 upon by lcina- f me-

The Doctor has alſo given plates of the ſtains made upon paper, by the calcination of iron, copper, braſs, ſilver, and gold. Thoſe made by copper and braſs wires are remarkably beautiful, and are variegated with yellow, green, and a very bright brown. Eight inches of gold-wire, $\frac{1}{85}$th of an inch in diameter, were, by the exploſion, reduced to a purple ſubſtance, of which a part roſe like a thick ſmoke, and the remainder, falling on the paper, left a ſtain diverſified with different ſhades of this colour. Gold, ſilver, and copper, cannot eaſily be melted into globules. Our author has once accidentally ſucceeded in this; but it required a degree of electrical force ſo very particular, that the medium between a charge, which only broke the wire into pieces, and one which entirely calcined it, could not be aſcertained by the electrometer.

5 upon con- in ſtca- r.

Though Dr Van Marum was convinced, by M. Lavoiſier's experiments, that metals, calcined in atmoſpherical air, abſorb from it that principle which renders it fit for reſpiration; yet he reſolved further to inveſtigate this point, by trying what would be the effect of a diſcharge of the battery through a piece of wire confined in phlogiſticated air. For this purpoſe, he took air, in which a burning coal had been extinguiſhed, and which had afterwards ſtood eight days upon water, that it might be entirely cleared from fixed air; with this he filled a glaſs cylinder, four inches in diameter, and ſix inches high, cloſed at the upper end with a braſs-plate; from the centre of this plate the wire was ſuſpended, on which the experiment was made. The cylinder was ſet in a pewter diſh filled with water; and, to prevent its being broken by the expanſion of the air, its lower edges were ſupported by two pieces of wood half an inch high. The lower end of the wire reſted on the diſh, which was connected with the outſide coating of the battery.

6 hlo- ted

On tranſmitting the charge, in this manner, through wires of lead, tin, and iron, of only half the length of thoſe which were calcined by an equal exploſion in atmoſpheric air, no calcination took place. The firſt was reduced to a fine powder, which, upon trial by ſpirit of nitre, appeared to be merely lead; the two other metals were melted into ſmall globules.

The Doctor then tried the ſame experiment in pure or dephlogiſticated air, obtained from red precipitate; thinking that, in this, the metals would be more highly calcined than in common air. His expectation was anſwered only by the lead, which was entirely reduced to a yellow calx, perfectly reſembling maſſicot. The other metals were not more highly calcined in this than in common air; but the globules of iron acquired ſo great a heat, as to retain it for ſome ſeconds, even in the water, and to melt holes in the pewter diſh into which they fell.

In nitrous air, calcination took place as eaſily as in common or in dephlogiſticated air. This was contrary to Dr Van Marum's expectation; but he accounts for it, by obſerving that, from the experiments of Mr Cavendiſh and of M. Lavoiſier, pure air appears to be one of the component parts of the nitrous acid.

Miſcellaneous Experiments.

157 Phenomena in the calcination of metals in water.

In order to illuſtrate M. Lavoiſier's theory, Dr Van Marum reſolved to examine the phenomena reſulting from the calcination of metals in water. This he tried with both iron and lead; and found that, in the moment of the exploſion, a number of air-bubbles appeared on the ſurface, and the calx roſe, like a cloud, through the water. This, he thinks, is not ſo eaſily accounted for by the theory of Stahl as by that of M. Lavoiſier; becauſe, according to the former, water does not readily either receive or part with phlogiſton; whereas the latter ſuppoſes this fluid to be compoſed of the oxigenous principle, united with that of inflammable air. If this be true, nothing more is neceſſary to calcination, than that the metal ſhould acquire a greater affinity with the oxigenous principle, that ſubſiſts between this and that of inflammable air, united with it in the compoſition of water. To collect the air generated by theſe calcinations was no eaſy matter; as the violence of the ſhock broke the glaſs receivers employed for this purpoſe: at laſt, however, the Doctor contrived a method of receiving it in a glazed ſtone baſon. From the firſt calcination of lead, about a quarter of a cubic inch of air was produced, which ſhowed no ſigns of inflammability; but, on every repetition of the experiment, a leſs quantity of air was generated; and on an accurate trial of that produced by the fourth calcination in the ſame water, it was found to conſiſt of one part of inflammable and three of atmoſpherical air. Our author deſigns to repeat theſe experiments with water deprived of its air, by being boiled.

158 Phenomena of earthquakes imitated.

In order to imitate the phenomena of earthquakes, this ingenious philoſopher followed Dr Prieſtley's method, and made the electrical exploſion paſs over a board, floating on water, on which ſeveral columns of wood were erected; but this ſucceeded only once. Reflecting that the electric exploſion exerts the greateſt lateral force when it paſſes through imperfect conductors, and that water is probably its principal ſubterraneous conductor, he laid two ſmooth boards upon each other, moiſtening the ſides in contact with water: upon the uppermoſt, he placed pieces of wood, in imitation of buildings, the baſes of which were 3 inches long and $1\frac{1}{2}$ broad. When the charge of the battery was tranſmitted between the boards, all theſe were thrown down by the tremulous and undulatory motion of that on which they ſtood.

159 Brookes's experiments on the force of batteries.

Mr Brookes, electrician at Norwich, has made a great number of experiments, with a view to determine exactly the force of batteries of an inferior ſize in melting fine wires of different kinds. In theſe he was particularly careful to aſcertain the degree to which his batteries were charged; and this he did by the method which ſhall afterwards be ſhown to be the beſt, viz. that of determining the power of the electricity by the weight which it was capable of raiſing by its repulſive power; and therefore, in the following experiments, the phraſe of batteries being charged to ſo many grains, implies that the repulſive power of the knob of the battery was able to raiſe that weight.

Miſcellaneous Experiments.

Some of the moſt remarkable of theſe experiments were as follow:

" 1. With a battery of nine bottles, containing about 16 ſquare feet of coated ſurface, charged to 32 grains of repulſion, which charge was ſent through a piece of ſteel wire 12 inches long and $\frac{1}{100}$th of an inch thick 11 times; the wire was ſhortened one inch and a half, being then about 10 inches and an half long; the 12th time, the wire was melted to pieces.

" 2. A charge, with the ſame nine bottles, to 32 grains of repulſion, being ſent through a piece of ſteel wire 12 inches long and $\frac{1}{170}$th of an inch thick, the firſt time melted the whole of it into ſmall globules.

" 3. A charge of the ſame nine bottles charged to 32 grains, being ſent through a piece of *braſs* wire 12 inches long, $\frac{1}{170}$th of an inch thick, the whole of it was melted, with much ſmoke, almoſt like gunpowder; but the metallic part of it, after it was melted, formed itſelf, in cooling, chiefly into concave hemiſpherical figures of various ſizes.

" 4. With only eight of the above bottles charged to 32 grains, the charge did but juſt melt 12 inches of the ſteel wire $\frac{1}{170}$th of an inch thick, ſo as to fall into ſeveral pieces; which pieces in cooling formed themſelves into oblong lumps joining to each other by a very ſmall part of the wire between each lump, which was not melted enough to ſeparate, but appeared like oblong beads on a thread at different diſtances.

" 5. The ſame eight bottles charged to 32 grains, ſo perfectly heated 12 inches of braſs wire, about $\frac{1}{170}$th of an inch thick, as to melt it, or ſoften it enough for it to fall down by its own weight (from the forceps with which it was held at each end) upon a ſheet of paper placed under to catch it; and when it fell down, it was ſo perfectly flexible, that by falling, it formed itſelf into a bent, or rather vermicular ſhape, and remained entire its whole length, *i. e.* about 12 inches when it was put into the forceps; but after it was fallen on the paper, it ſagged ſo much as to be ſtretched by its own weight from 12 to about 15 inches long; and by falling on the paper it flattened itſelf the whole length of it, ſo that when it was examined with an half inch magnifier, it appeared about five or ſix times broader than it was in thickneſs.

" 6. With nine bottles again, charged only to 20 grains, the charge was ſent through 12 inches of ſteel wire $\frac{1}{170}$th of an inch thick, which heated it enough to melt it ſo as to be ſeparated in many places; and the pieces formed themſelves into ſtrung-bead-like ſhapes, as in experiment 4.

" 7. With the ſame nine bottles charged to 20 grains, the charge was ſent through 10 inches of braſs wire $\frac{1}{170}$th of an inch thick; the wire was heated ſo red hot as to be very flexible, yet it did not ſeparate, but was ſhortened near $\frac{3}{8}$ths of an inch.

" 8. A charge of nine bottles, charged to 20 grains, ſent a ſecond time through the laſt piece of wire, melted it aſunder in three places.

" 9. Nine bottles charged to 30 grains, and the charge ſent through 12 inches of braſs wire $\frac{1}{170}$th of an inch thick, treated it nearly as in experiment 5. except that it was ſeparated in two places, and the pieces meaſured about 16 inches and an half long; but perfectly flattened by its fall on the paper, as before.

" 10. Nine bottles charged to 30 grains, and the charge being ſent through eight inches and a half of braſs wire the ſize of the laſt, wholly diſperſed it in ſmoke, and left nothing remaining to fall on the ſheet of paper placed under it.

" 11. With 12 bottles, charged to 20 grains, the charge was ſent through ten inches of ſteel wire one-hundredth of an inch thick, which made the wire red hot, but did not melt it.

" 12. A ſecond charge, the ſame as the laſt, was ſent through the ſame piece of wire, which heated it red hot as the firſt did, but it was not ſeparated; this piece of wire was now ſhortened five-ſixteenths of an inch.

" 13. A charge to 25 grains, with the ſame 12 bottles, was ſent through the laſt piece of wire, which melted it into many pieces, and many globules of calcined metal.

" 14. A charge of 15 bottles, charged to 25 grains, was ſent through ten inches of ſteel wire one-hundredth of an inch thick, which melted it the firſt time, and diſperſed a great part of it about the room.

" 15. A charge with the laſt 15 bottles, charged to 20 grains, juſt melted ten inches of ſteel wire the ſize of the former, ſo as to run into beautiful globules, nearly as in exp. 13.

" 16. A charge of 15 bottles, charged to 15 grains, being ſent through ten inches of ſteel wire the ſize of the laſt, it was barely made red hot; but it was ſhortened one-tenth of an inch by the ſtroke paſſing through it.

" 17. The laſt piece of wire having a charge of 15 bottles, charged to twelve and a half grains, ſent thro' it, was not made red hot.

" 18. A charge of the ſame 15 bottles, charged to 25 grains, was ſent through the ſame piece of wire, which ſeemingly tore the wire into ſplinters.

" 19. Four bottles, charged to 30 grains, juſt melted three inches of ſteel wire one hundred and ſeventieth of an inch thick, ſo as to fall into pieces.

" 20. Five bottles, charged to 25 grains, moſt beautifully melted three inches of ſuch wire as the laſt into large globules.

" 21. Eight bottles, charged to 15 grains, melted three inches of ſteel wire one hundred and ſeventieth of an inch thick, ſimilar to the five in the laſt experiment; ſo nearly alike both in appearance and effect, that it might have been ſaid to be the ſame.

" 22. Ten bottles charged to twelve and a half grains, rather exceeded exp. 19. but ſcarcely came up to exp. 20. and 21.

" 23. Suſpecting ſomething in exp. 19. I found, that though my bottles hitherto were as nearly of the ſame ſize as I could procure them, yet ſome of them were a little larger than others, and, which was the caſe in exp. 19. one of the four was ſmaller than the other three; ſo that I repeated the experiment with four bottles more equal in ſize, and charged them to 30 grains, and the fuſion was as perfect as in any.

" 24. A charge to 20 grains, with the laſt eight bottles, very finely melted ſix inches of ſteel wire one hundred and ſeventieth of an inch thick.

“ 25. With two bottles, charged to 45 grains, the charge was ſent through one inch of ſuch ſized ſteel wire as the laſt, which only changed its colour.

“ 26. Three bottles, with a 40 grains charge, diſperſed one inch and a half of ſteel wire, the ſize of the laſt, all about the room.

“ 27. As a ſteel wire of one-hundredth of an inch thick has nearly double the quantity of metal of a wire one hundred and ſeventieth of an inch thick, ſo I took three inches of the former, and ſent a 25 grains charge with ten bottles through it, which melted it juſt as the five bottles did in exp 20.

“ 28. Twenty bottles, charged to twelve grains and a half, melted three inches of ſteel wire, the ſize of the laſt, exactly ſimilar to the foregoing experiment.

“ 29. As a ſteel wire of one-eightieth of an inch thick contains nearly twice the quantity of metal in the ſame length as a ſteel wire of one-hundredth, or four times the quantity of a ſteel wire of one hundred and ſeventieth of an inch thick; ſo it might, from the foregoing experiments, be expected that 20 bottles, charged to 25 grains, would melt three inches of ſteel wire one-eightieth of an inch thick; but on a great many trials 20 bottles could not be procured that would bear the diſcharge, when charged to 25 grains: for at the diſcharge there would be always one or more bottles broken or perforated. I was now reduced to the neceſſity of being content with getting bottles of any ſize that would bear the required charge, from one to three gallons each, or that contained from about 150 to 300, or more, ſquare inches of coated ſurface, each; but all in vain. my only reſource left (as I was not near any glaſs houſe). was to increaſe the quantity of ſurface, and not to charge ſo high, and to proportion the one to the other: a third part was concluded on to be tried; that is, inſtead of about 36 feet of coating, I added one third, or 12 feet, which made it 48 feet: and that, inſtead of charging to 25 grains, or 24 grains, which divides by 3 better, to omit one-third of the height of the charge, which leaves 16 grains: and thus I ſucceeded perfectly well; for 3 inches of ſteel wire one-eightieth of an inch thick was as curiouſly melted with 48 feet of coated ſurface, charged to 16 grains, as any of the former.

“ Theſe bottles, thus broken in large diſcharges, ſeem always to break. or to be ſtruck through, nearly in the thinneſt, but never in the thickeſt place, which ſhows the neceſſity of the ſubſtance in the glaſs.

30. “ As in exp. 19. and 21. where the former is but half the quantity of coated ſurface of the latter, charged to 30, and the latter to 15 grains, to know how high 48 feet of coating muſt be charged to produce the ſame effect exactly: and as the quantity of coating in four bottles, conſiſting of a little more than ſix feet and a half, is contained in 48 feet a little more than ſeven times; ſo I tried by charging 48 feet only to a little more than four grains, or only about one ſeventh part ſo high, as four times ſeven is 28; that is, but two leſs than 30: and this had exactly the ſame effect on the wire, which was one hundred and ſeventieth of an inch thick, and three inches long, as the former.

31. “ As the laſt experiment agreed ſo exactly with exp. 19. and 20. the next thing tried was to ſee the effect of 48 feet of coated ſurface charged to a little more than four grains, upon ſix inches of ſteel wire, the ſize of the laſt; but this was only made very faintly red.

32. “ A repetition of the laſt experiment with the ſame length of the ſame wire, to ſee how often the ſame charge might be ſent through before it would be melted, and to obſerve the appearance of the wire after each ſtroke; the eighth ſtroke melted it into ſeveral pieces. After the firſt ſtroke, the redneſs grew leſs every time, even the laſt time, when it was ſeparated. The firſt ſtroke, though little more than fairly red, made it ſo flexible, that by a little more than its own weight (about a penny-weight more), it was apparently made perfectly ſtraight when it was cooled: about the third or fourth ſtroke it began to appear zigzagged; after the ſixth ſtroke the ſurface of it appeared rough; after the ſeventh ſtroke the ſurface was very roughly ſcorified or ſcaly; and ſome of the ſcales had fallen upon a piece of white paper, placed under it, at about half an inch diſtance below it. The eighth ſtroke melted it in three places; and at thoſe places where the angles appeared the ſharpeſt or moſt acute, a great number of the ſcaly appearances were driven off about the paper, which appeared like ſplinters (ſee exp. 18.); ſome of them were almoſt one-tenth of an inch long, and ſome of them about a third or a fourth part of the diameter of the wire in breadth, and very thin: after the ſeventh ſtroke it was ſhortened ſeven-ſixteenths of an inch: the wire was one hundred and ſeventieth of an inch thick.

“ 33. Repeating exp. 31. again with the ſame ſize and length of wire, and the ſame battery charged the ſame, in order to obſerve the method of the wire ſhortening, having fixed an inſulated gage parallel to and about a quarter of an inch diſtant from it: after the firſt ſtroke, which made the wire fairly red, (it being fixed at one end, that the ſhortening might appear all at the other, which was held ſo as either to contract or dilate), I obſerved that it ſhortened conſiderably as it cooled; repeating the ſtroke, it did the ſame, and ſo on till it was melted, which was by the eighth ſtroke, as before. At the inſtant that the ſtroke paſſed thro' the wire it appeared to dilate a little, and after it was at its hoteſt, it gradually contracted after every ſtroke as it cooled, about one-ſixteenth of an inch each time; the dilating was ſo very little, as to bear but a very ſmall proportion to its contraction, and ſometimes it was doubtful whether or not it did dilate at all; but after all the obſervations it appeared oftener as if it did dilate, than as if it did not.

34. “ The ſame 48 feet, negatively charged to a little more than four grains, melted three inches of ſteel wire one hundred and ſeventieth of an inch thick, the ſame as the poſitive charge did in exp. 30.

“ 35. The ſame battery of 48 feet of coated ſurface, charged to a little more than eight grains, melted three inches of ſteel wire one-hundredth of an inch thick. This is very nearly in proportion to exp. 27. but here the charge was negative, and the fuſion was the moſt pleaſing of any I have hitherto had; probably owing to the charge, by chance, happening to be ſo well adjuſted as to be exactly ſufficient to melt the wire and no more: it held hot the longeſt, and the fuſed metal ran into the largeſt globules: probably the

length

length of the time that the heat continued, was owing to the charge being juſt ſufficient, and to the ſize of the lumps that the fuſed metal formed itſelf into.

"36. A repetition of exp. 1. with twelve inches of ſteel wire, one-hundredth of an inch thick, but with this difference, that as then I uſed only nine bottles, containing about 16 ſquare feet of coated ſurface charged to 32 grains, I here uſed 18 bottles containing about 32 ſquare feet of coating charged to only 16 grains. This was done, to obſerve the progreſs of the deſtruction of the wire, as in exp. 32, as well as to prove the ſimilarity of the effect. The wire being the ſame ſize, ſort of metal, and length, as recited juſt above; the firſt ſtroke made it fairly red-hot the whole length of it with ſmoke and ſmell, changed its colour to a kind of copperiſh hue, and ſhortened it conſiderably; the ſecond ſtroke made it of a fine blue, but it did not appear red, and ſhortened it more; at the third ſtroke, it became zigzagged, many radii were very viſible at the bendings, and continued to ſhorten till the eleventh ſtroke, when one of the bottles in the ſecond row of the battery was ſtruck through: the fracture was covered over with common cement, its place ſupplied by changing place with one in the third row, ſuppoſing the mended one to be the weakeſt; and thus, with the battery in this ſtate, I made the twelfth ſtroke, which ſeparated the wire, as in exp. 1. but this wire was ſhortened only one inch.

"37. A charge of 48 feet to eight grains, ſent through three inches of copper wire one hundred and ſeventieth of an inch thick, ſeven times, made it zigzagged, but not much ſhorter; the eighth ſtroke ſeparated it at one end, cloſe to the forceps which held it, but it did not appear to be made ſenſibly red-hot at all, notwithſtanding it muſt have been often ſo at the place where it was melted: which ſpace was ſo very ſmall as barely to be perceptible, like as when a point is ſet upon any flat ſurface of iron, and a ſtroke from a pound phial being ſent through, both the point and the flat ſurface where the point reſted, if examined with a magnifying glaſs, will be found to have been melted; and a ſpeck may be ſeen; but the redneſs of the metal will ſcarcely be viſible.

"38. A charge of 48 feet, to 16 grains, was ſent through ſix inches of lead wire one-fiftieth of an inch thick, which melted it into many pieces.

"39. A charge of 48 feet, to 15 grains, was ſent through ſix inches of wire like the laſt, which did not ſeparate it, but made it ſmoke.

"40. A charge like the laſt was ſent through the laſt piece of wire a ſecond time; which melted it into ſeveral pieces.

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Lead more eaſily deſtructible than any other metals.

"The law by which wires reſiſt deſtruction, in proportion to the thickneſs of the wire, does not ſeem to be ſo equable, by much, in the lead as in the ſteel wire. For a charge of four grains, in exp. 34. melted three inches of lead wire one ſixty-ſixth of an inch thick: but it took a charge of about three times that power to deſtroy three inches of lead wire one-fiftieth of an inch thick; which is about double the quantity of metal in the ſame length as in that of one ſixty-ſixth of an inch thick. Thus it is eaſy to find, what different reſiſtance a wire of any of the foregoing metals, of equal ſize and length, will make to the electrical ſtroke or to lightning.

"The length of the electric circuit, in which the different wires were placed, in the foregoing experiments, from the neareſt part of the inſide to the near part of the outſide of the battery, excluſive of the length of the ſaid wires, was about eight feet.

"Notwithſtanding the eaſy deſtruction of the lead wire by the electrical ſtroke, it ſeems greatly to be doubted, whether any thunder ſtrokes happen in any place whatever, ſtrong enough to deſtroy a ſtrip of lead four inches broad and of the thickneſs of about eight pounds to the foot. Whence it may be preſumed, that ſuch a ſtrip of lead may be perfectly ſafe for conductors through buildings of any kind whatever: as it is not much ſubject to decay in any common expoſure.

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Violent plofionf an elect battery.

"41. Two gentlemen coming in to ſee a piece of wire melted by electricity, I proceeded to ſhow it them, by fixing 12 inches of ſteel wire one-hundred and ſeventieth of an inch thick, in the forceps, and then (ſuppoſing the electrometer and all other things ready placed) to charge the battery, but the electrometer did not move; nevertheleſs I continued charging as I ſuppoſed; but ſtill the electrometer remained as it was, although I had been charging much longer than would have been neceſſary, contrary to my deſign, which was to take a ſmall wire, that a ſmall charge might be ſufficient. Having been charging a long time, I left off to look about the apparatus, in order to ſee if any thing was not right: as I was looking, I found there was no communication to the electrometer, and heard a ſmall crackling in the battery, which convinced me that it was charged. Accordingly I made the diſcharge, expecting nothing unuſual; but the wire was diſperſed ſeemingly in a very violent manner. The report was ſo very loud that our ears were ſtunned, and the flaſh of light ſo very great, that my ſight was quite confuſed for a few ſeconds. The ſingularity of the appearances attending this experiment led me to inſert it."

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Milner's account the Ley phial.

Though from what has been ſaid under ſection VI. the direction of the electric fluid *outwards* from a body poſitively electrified, and inwards from one negatively ſo, ſeems to be ſufficiently aſcertained, yet ſome experiments related by Mr Nicholſon in the laſt volume of the Philoſophical Tranſactions, which ſeem to militate againſt this doctrine, require a particular conſideration; and for this reaſon we ſhall here not only give an account of theſe, but of ſome others made on the ſubject of excitation, and the ſtate of a charged phial in general, which ſeem to throw ſome light upon the ſubject. Mr Milner, who has been at great pains to inquire into this matter, makes the following obſervations:

"I. In the charged phial, when the inſide has either kind of electricity communicated to it, the outſide is found to poſſeſs a contrary power. It appears alſo from the preceding experiments, that either kind of electricity always produces the other on any conducting ſubſtance placed within the ſphere of influence. And as the ſame effect is alſo produced on electrics themſelves, in the ſame ſituation, and as ſome portion of the air ſuppoſing no other ſubſtance to be near enough, muſt be unavoidably expoſed to ſuch influence, it neceſſarily follows, that neither power can exiſt without the other; and therefore, in every poſſible caſe, poſitive and negative electricity are inſeparably united.

"II. A phial cannot be fully charged, by which the outſide acquires a contrary electricity, unleſs the external coating has a communication by ſome conductor with the earth. In the ſame manner, a full charge of the contrary electricity cannot readily be procured in theſe experiments without a ſimilar communication.

"III. In both caſes the interpoſition of an electric body between the contrary powers is abſolutely neceſſary. In one caſe that body is glaſs, in the other it is air; and the experiment will not ſucceed in either, unleſs both the glaſs and the air be tolerably free from moiſture.

"IV. It appears from the 18th experiment, that the influence of electricity acts in the ſame manner through glaſs as it does through the air, and produces a contrary power in both caſes.

"V. A communication of the electric matter is more eaſily made through the fluid yielding ſubſtance of the air than through glaſs; which is ſo hard and ſolid a body, as to require a very conſiderable degree of power to ſeparate its component particles: this, however, ſometimes happens, and a hole is made thro' the glaſs itſelf, without deſign, in attempting to charge a very thin phial as high as poſſible, in the moſt favourable ſtate of the atmoſphere.

"VI. A conducting body receives the ſtrongeſt charge of the contrary electricity, in theſe experiments when it is brought as near as poſſible to the electric power, without being within the communicating diſtance. And it is well known that the thinneſt phial, if it be ſtrong enough to prevent a communication between the two ſurfaces, will always receive the higheſt charge.

"VII. The electricity of the external ſurface of the charged phial cannot be deſtroyed, ſo long as the internal ſurface remains in force, and continues to exert its influence through the glaſs; becauſe this influence was the cauſe of the contrary electricity on the external ſurface, and muſt therefore preſerve it.

"VIII. If part of the courſe which the electric matter takes in diſcharging a phial be through the air, a ſmall part of the charge will always remain; becauſe the whole of the redundancy on one ſurface is not capable of forcing a paſſage through the reſiſting medium of the air, in order to ſupply the deficiency on the other ſurface. But if every part of the circuit, from the internal to the external coating, conſiſts of the beſt conductors, and if the coated ſurfaces be nearly equal, and directly oppoſite to each other, the phial will then appear to have retained no part of the charge, ſo far as it is covered with tin-foil; but the parts of it above the coating on both ſides will, however, ſtill retain the contrary electricities, after the circuit has been completed (G). A reſidue of the charge may alſo be obſerved in every other inſtance of electrification, in which the degree of electricity is ſufficient to force a communication between the electrified body and a conductor not inſulated, through a ſmall portion of the ai: and if the experiment be carefully made, it will appear, that the whole of the redundancy is not capable of paſſing through the reſiſting intermediate air, in any caſe, and therefore a part of the charge muſt always remain. This may be conveniently ſhown by uſing a well excited electrophorus of about five inches diameter, the metal cover of which may be ſo ſtrongly electrified, as to force a communication through the air, to any good conductor not inſulated, at the diſtance of three quarters of an inch. After this, a ſecond communication much weaker than the firſt may be made at the diſtance of about the twelfth-part of an inch, which is the reſidue of the charge, or rather a part of it: for if the ſecond communication be carefully made through the air, without touching the cover, it will be found ſtill to have retained enough of the firſt charge to electrify a pair of vertical needles.

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"As it appears from this view, that both theſe caſes are ſimilar in ſo many remarkable particulars, it follows, that they are eſſentially the ſame, notwithſtanding they differ in the degree of power and ſome other circumſtances, which may alter the form of an experiment without changing its nature. It is apprehended, therefore, that the above mentioned diſtinction will not only appear to be unneceſſary, but alſo that either power cannot poſſibly exiſt without the other, as it has been ſhown under the firſt particular, that poſitive and negative electricity were inſeparably united. But here it will be proper to examine more particularly the nature of charged glaſs.

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A phial is not brought to its natural ſtate by being diſcharged.

"1. When a plate of coated glaſs has been charged, and the circuit between the coatings has been completed, by the mediation of a good conducting ſubſtance, no part of the coated ſurface is ſuppoſed to retain any part of the charge; but, according to the commonly received doctrine, the whole of it is ſaid to be diſcharged; or in other words, to be brought into its natural ſtate. This, however, is not really the caſe, as will evidently appear from the following experiment; the deſign of which is to ſhow the effects produced by charging and diſcharging a plate of glaſs.

"2. Let the middle of a piece of crown window-glaſs, ſeven inches ſquare, be placed between two circular plates of braſs, about the 16th part of an inch thick, and five inches in diameter. In order to enable theſe plates to retain a greater degree of power, it will be proper to terminate each of them with a round bead the third part of an inch thick; and the whole of the bead ſhould be formed on one ſide of the plate, that the other ſide may remain quite flat, and apply well to the ſurface of the glaſs. Let the whole be inſulated:

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"(G) The whole remainder of the charged phial muſt not, however, be aſcribed to the cauſe above mentioned: for after taking away that part of it belonging to the coated ſurface, which could not force a paſſage through the air, if the phial be allowed to ſtand a ſhort time on the table, the coated ſurface will again gradually acquire ſome power, which muſt be derived from the charge of the phial above the coating. Another ſource of the reſiduum will appear in the next experiment."

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lated about four inches above the table, and in an horizontal poſition, by faſtening one end of a cylindrical piece of ſome good inſulating ſubſtance to the middle of the under plate, the other end of it being fixed in any convenient ſtand. Let a like inſulating ſtem be faſtened to the middle of the upper plate. Let a braſs chain, which may eaſily be removed, reach from the under plate to the table. In the laſt place, bend a piece of braſs wire into ſuch a ſhape that it may ſtand perpendicularly on the upper plate; and let the upper extremity of this wire be formed into an hook, that it may be removed at any time by the aſſiſtance of a ſilk ſtring, without deſtroying the inſulation of the plate.

" 3. The glaſs being thus coated with metal on both ſides, and having alſo a proper communication with the table, will admit of being charged; and both coatings may be ſeparated from the glaſs, and examined apart, without deſtroying the inſulation of either: for the upper coating may be ſeparated by the means of its own proper ſtem; and the under coating may be ſeparated by taking hold of the corners of the glaſs, and lifting the glaſs itſelf. As glaſs readily attracts moiſture from the atmoſphere, it will therefore be neceſſary to warm it in the beginning, and to repeat it ſeveral times in the courſe of the experiment, unleſs the air ſhould be very dry.

" 4. Excite a ſmooth glaſs tube, of the common ſize, by rubbing it with ſilk, and apply it repeatedly to the bent wire until the glaſs be well charged. Then remove the chain, which reaches from the lower plate to the table, and alſo the charging wire from the upper plate, by laying hold of its hook with a ſilk ſtring. It neceſſarily follows, from conſidering the quality of the power employed in the preſent caſe, that the upper ſurface of the glaſs, together with the upper coating, muſt be electrified poſitively; and that the under ſurface and coating muſt be electrified negatively: but as it is deſigned in this experiment to examine the powers of charged glaſs, that no virtue may be imputed to the glaſs but what really belongs to it, let both coatings be ſeparated from it; and after they have been brought to their natural ſtate, by touching them with a conducting body not inſulated, let the glaſs be replaced between them; and whatever effects may now be produced, muſt be aſcribed ſolely to the powers of the charged glaſs. On bringing a finger near the upper coating, a ſmall electrical ſpark will appear between that coating and the finger, attended with a ſnapping noiſe. Apply a finger in the ſame manner to the under coating, and the ſame thing will happen. This effect cannot be produced twice, by two ſucceeding applications to the ſame coating; but it may be repeated ſeveral hundred times over, in a favourable ſtate of the atmoſphere, by alternate applications to the two coatings; and the powers of the glaſs will be thus gradually weakened.

" 5. This part of the experiment may be explained, by obſerving, that the contrary electricities have a natural tendency to produce, and to preſerve each other, on the oppoſite ſides of a plate of glaſs; and therefore, the increaſe or decreaſe of power, on either ſurface, muſt be regulated by the increaſe or decreaſe of the contrary power on the other ſide: and as in charging a plate of glaſs poſitively, no gradual addition of electric matter can be made to the upper ſurface, without a proper conveyance for a proportionable part to paſs away from the lower ſurface; ſo in this method of uncharging it, the electric matter cannot be gradually taken away from the upper ſurface, without adding a proportionable part to the under ſurface: one operation is the reverſe of the other, and ſo are the effects; one caſe being attended with an increaſe and the other with a decreaſe of power.

" 6. Let the glaſs be again fully charged, and after bringing both coatings to their natural ſtate as before, let the glaſs be replaced between them; and on touching the upper coating with a finger, and then ſeparating it from the upper and poſitive ſurface of the glaſs by the inſulating ſtem, this coating will acquire a weak negative power, which will be ſufficient to produce a ſmall ſpark while the glaſs is in full force, though after the power of the glaſs has been reduced, it will give little or no ſpark: but, in both caſes, on touching the coatings alternately two or three times, the negative power of this coating, when ſeparated from the poſitive ſurface of the glaſs, will be ſo conſiderably increaſed, as to produce ſtrong negative ſparks.—This effect may now be repeated ſeveral times, by only touching the upper coating, but the ſparks will grow weaker every time; and they may be reſtored again to nearly their former ſtrength, by alternate applications to both coatings, as before. The ſame things will alſo happen to the under coating, in the ſame circumſtances; but with this difference, that the power of the under coating, on being ſeparated from the under and negative ſurface of the glaſs, will be poſitive. And thus a long ſucceſſion of both poſitive and negative ſparks may be produced in favourable weather; or at any time by keeping the glaſs moderately warm.

" 7. It appears from this part of the experiment, that each of the ſurfaces of the charged glaſs has a power of producing a contrary electricity in the coating in contact with it, by a momentary interruption of the inſulation. It neceſſarily follows in producing theſe effects, that more electrical matter muſt have paſſed away from the upper coating, at the time of touching it, than the ſame coating could receive from the upper ſurface of the glaſs; and therefore, the upper coating, by loſing ſome of its natural quantity, will be negatively electrified: and alſo, that more electric matter muſt have been added to the under coating at the time of touching it, than the under ſurface of the glaſs could receive from it; and therefore the under coating, by receiving ſome addition to its natural quantity, will be poſitively electrified. It appears further, that the greateſt degree of this influential power, which may be conſiſtent with the circumſtances of the caſe, will be produced in either coating, by taking care at the ſame time to bring the oppoſite coating into a like ſtate of influential electricity: and thus it is evident, that the influential powers of the two coatings have the ſame relation to each other as the contrary powers of the glaſs itſelf, and will therefore always increaſe or decreaſe together.

" 8. The glaſs being again well charged as at firſt, let a braſs wire bent in the form of a ſtaple be brought into contact with the upper and lower coating at the ſame time. By this the common diſcharge will be made: but the equilibrium of the coated glaſs will be

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only reſtored in part; for a conſiderable degree of attraction will happen at the ſame time between the upper coating and the glaſs, which has frequently been ſtrong enough to lift a piece of plate-glaſs weighing ten ounces (H). Neither coating will now ſhow the leaſt external ſign of electricity while it is in contact with the glaſs; but on ſeparating either of them from it, if care be taken to preſerve their inſulations, the upper coating will be ſtrongly electrified negatively, and the under coating will be ſtrongly electrified poſitively. Let then both coatings be brought to their natural ſtate, by touching them when ſeparated from the glaſs, with a conducting body not inſulated, and let the glaſs be replaced between them as before. In this ſtate of things, on touching the upper coating only, and ſeparating it from the glaſs, it will not be capable of giving any ſpark; but on touching the coatings alternately five or ſix times, it will then give a weak ſpark; and this may now be repeated ſeveral times by only touching the upper coating: but on a ſecond application of the bent wire to both coatings at the ſame time, a ſecond diſcharge may be perceived, though much weaker than the firſt, and the coatings will be again brought into the ſame electrical ſtate as immediately after the firſt diſcharge. This may frequently be repeated; and a conſiderable number of ſtrong negative ſparks may be taken from the coating when it is ſeparated from the poſitive ſurface of the glaſs. If the glaſs in replacing it between the two plates be turned upſide down, the electrical powers of both coatings will be changed by the next application of the diſcharging wire to complete the circuit; and a ſucceſſion of ſtrong poſitive ſparks may be taken from the coating when it is ſeparated from the negative ſurface of the glaſs.

"9. It appears from this part of the experiment, that the coated part of the charged glaſs was not brought into its natural ſtate by completing the circuit between the coatings; but that it ſtill retained a degree of permanent electricity; that the powers of both coatings were actually changed at the time of the firſt diſcharge; and that a ſucceſſion of the ſame powers may be produced in the coatings, without renewing the leaſt application of electricity to the glaſs itſelf.

"10. The whole quantity of electric matter added to the glaſs in charging it, is evidently diſtinguiſhed into two parts in this experiment. The firſt part, which is by far the moſt conſiderable, appears to have been readily communicated from one ſurface of the glaſs to the other, along the bent wire, when it was firſt brought into contact with both coatings at the ſame time. The ſecond part of the charge appears to be more permanent, and remains ſtill united with the glaſs, notwithſtanding the circuit has been completed (I). This permanent electricity, as well as the other, muſt be poſitive on the upper ſurface, and negative on the lower ſurface; becauſe, in the preſent experiment, the charge was given by a ſmooth glaſs tube excited with a ſilk rubber. Now, the influence of the oppoſite and permanent powers on the different ſides of the glaſs (each ſide having a tendency to bring the coating in contact with it into a ſtate of electricity contrary to its own) muſt aſſiſt each other, in cauſing part of the electric matter naturally belonging to the upper coating to paſs away from it to the under coating, along the diſcharging wire, and at the ſame time the ſurcharge to paſs the ſame way. The upper coating, therefore, by loſing ſome part of its natural quantity, muſt be negatively electrified; and the under coating, by receiving an addition to its natural quantity, muſt be poſitively electrified. The whole quantity of electric matter, which the influence of the permanent electricity of the glaſs is capable of taking from one coating and of adding to the other, bears but a ſmall proportion to the whole charge: and therefore the ſecond and every ſubſequent diſcharge muſt be conſiderably weaker than the firſt.

"11. It appears from ſeveral of the preceding experiments, that a conſiderable degree of influential power may be produced at ſome diſtance by an electric in full force; and therefore a ſmall excited body of a cylindrical ſhape was ſufficient to anſwer that purpoſe: but when the excited electric has been ſo far weakened that it cannot communicate its own power, nor produce this influential power in any body, unleſs it be brought very near or in contact with it, bodies of a cylindrical form muſt then act to great diſadvantage, and a ſmall degree of power only can be produced; becauſe the ſtrength of the influential electricity in this caſe will be in proportion to the ſurfaces of the electric and conducting bodies, which are brought near together, or in contact with each other; and therefore a plate of glaſs in the ſame circumſtances, whether its permanent power be derived from excitation or communication, is enabled from its ſhape to produce a conſiderable degree of the influential powers in the coatings in contact with it.

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Hypotheſis concerning the electrophorus.

"12. It appears from this experiment, that the ingenious profeſſor Volta's electrophorus is, in reality, a reſinous plate charged with permanent electricity by friction: and becauſe there is a leſs diſpoſition in a body of this kind to attract moiſture from the atmoſphere than there is in glaſs; it will retain the power better, and conſequently be the longer capable of producing a contrary electricity in the inſulated metal cover. If it ſhould be thought neceſſary to ſupport this obſervation by a direct experiment, it may eaſily be done by making a thin flat plate of any reſinous electric ſubſtance, and larger than the inſulated cover, but without faſtening a

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"(H) The whole of this effect muſt not be aſcribed to the attraction of electricity. Perhaps the paſſage of electric matter between the coating and the glaſs may help to exclude the air; and then the attraction of coheſion, and the preſſure of the external air both above and below, may be ſuppoſed to have the moſt conſiderable ſhare in producing this effect.

"(I) Some new terms ſeem to be wanted in order to expreſs with preciſion the different parts of the charge. And if that part of it which cannot be deſtroyed by completing the circuit, ſhould be called *the permanent part of the charge*, or more ſimply *the charge*: then might the other part, or that which may be deſtroyed by completing the circuit, be named the *ſurcharge*.

a coating to either ſurface; and then, whether this plate be charged by excitation or communication, one of its ſides will be poſitive and the other ſide negative; and a ſucceſſion of poſitive ſparks may be produced on the negative ſide, and of negative ſparks on the poſitive ſide, by a proper application of the inſulated metal cover. It will be alſo found, that this reſinous plate cannot be well charged, either by excitation or communication, unleſs a coating of ſome conducting matter ſhould be kept in contact with the under ſurface; and it ſhould alſo have ſome communication with the floor.

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How to charge a phial without friction.

“ 13. It has been very properly recommended to uſe a particular kind of rubber, and to attend to the ſtate of it, in order to excite glaſs well; but it will not be neceſſary to pay the leaſt regard to theſe circumſtances in the following experiments, in which a method will be ſhown of charging a ſmall phial and a plate of glaſs at the ſame time, by a gradual accumulation of power; that power being entirely derived from the glaſs itſelf, and with no other degree or kind of friction than is neceſſarily connected with the form of the experiment.

“ 14. Place a circle of tin-foil five inches in diameter on the table, between a ſoft piece of baize and the middle of the ſame plate of glaſs that was uſed in the laſt experiment, which will thus be coated on the under ſide; and in order to preſerve a proper communication with this coating, let a fillet of tin-foil reach from it beyond the extremity of the glaſs. The ſame inſulated metal cover is to be uſed for the upper coating as before. Let a thin ounce-phial of glaſs be filled with braſs-filings, and coated with tin-foil on the outſide to about one inch from the top. Let a large braſs wire, the fifth part of an inch in diameter, paſs through the cork of the phial into the filings, about an inch of it being left above the cork, and let the upper extremity of this wire be well rounded. This experiment requires, that the whole conſtruction ſhould be well warmed at firſt; and it will be neceſſary to repeat it at proper intervals, unleſs the atmoſphere ſhould be very dry.

“ 15. Taking hold of the wire of the phial with one hand, let it be placed on the upper ſurface of the glaſs, and its bottom carried in contact over the middle of the upper ſurface, as far as the tin-foil coating reaches on the under ſide: and during this part of the operation, a finger of the other hand muſt be kept in contact with the fillet of tin-foil. Then lifting the phial by the wire with one hand, let it be placed on the inſulated metal cover, ſuſpended in the air with the other hand; and after ſhifting the hand from the wire to the coating, let the bottom of the phial be placed on the end of the tin-foil fillet. Place the inſulated metal cover on the middle of the glaſs, and touch it with a finger of one hand, while the other hand touches the tin-foil fillet. Now lift the inſulated cover by its ſtem, and bring the head of the cover in contact with the wire of the phial, and a very ſmall ſpark of light will appear between them. Let this be repeated in the ſame manner about 15 times, taking care to preſerve a proper communication between the coating and the floor. Then taking hold of the phial by the coating, let it be replaced on the inſulated cover while it is ſuſpended in the air; and after ſhifting the hand from the coating to the wire, let it be again placed on the middle of the glaſs, and let the bottom be again carried in contact over the middle of the glaſs, holding the wire in one hand, while the other has a proper communication with the tin-foil coating. Let the phial be again returned to the tin-foil fillet as before, and let the inſulated cover be applied repeatedly to the wire, immediately after every ſeparation from the glaſs; and a brighter ſpark, together with a weak ſnapping, will now attend each application, if it be carefully obſerved to touch the cover with one hand before every ſeparation, while the other hand reſts on the fillet of tin-foil. By proceeding in this manner, after the third application of the phial to the glaſs, a very weak ſhock will be felt in thoſe fingers which are uſed in completing the circuit of the glaſs; and after repeating two rounds more in the manner before mentioned, the phial will be fully charged. By applying the coating of the phial when it is in full force to the upper ſurface as before, the glaſs plate will get the greateſt power it is thus capable of receiving, and will then give a ſhock as high as the elbows. After this, on attempting to lift the inſulated cover, the glaſs itſelf will generally be lifted at the ſame time, with the tin-foil coating adhering to the under ſurface: but by continuing the ſeparations of the cover from the glaſs, a ſucceſſion of ſtrong negative ſparks may be produced by the influence of the upper ſurface; and by turning the glaſs over, and leaving the tin-foil coating on the baize, a ſucceſſion of ſtrong poſitive ſparks may be produced by the influence of the other ſide.

“ 16. This experiment may be performed more ſteadily by placing the glaſs, together with the tin-foil coating and baize, on a plate of metal about $\frac{1}{10}$th of an inch thick, and of the ſame ſquare as the glaſs. The whole may be faſtened together by two ſmall holdfaſts placed at the oppoſite corners, which will prevent the glaſs from being lifted. This plate of metal will be uſeful in another view; for after it has been ſufficiently warmed, by retaining heat well, it will help to keep the glaſs dry, and conſequently fit for uſe ſo much the longer. But when it ſhall be required to ſhow the contrary powers of the oppoſite ſides of the glaſs, it will be more convenient not to faſten the parts together, and the whole may be kept ſufficiently ſteady, by the operator's keeping down one corner of the glaſs with a finger, and by placing a proper weight on the oppoſite corner.

“ 17. The bottom of the phial cannot be carried in contact over the glaſs without producing ſome little degree of friction; from which the power in this experiment is originally derived. The cover will appear on examination to be electrified negatively after every ſeparation from the glaſs: but as it was touched in completing the circuit between the coatings before every ſeparation, it neceſſarily follows, that the cover can have only an influential electricity, and conſequently that the permanent power of the upper ſurface of the glaſs muſt be poſitive. The negative power of the cover is communicated to the wire of the phial, by which the inſide is electrified negatively and the outſide poſitively; and both theſe powers will increaſe with every application, becauſe the circumſtances of the phial are favourable to its charging. The phial muſt be inſulated every time it is required to ſhift the hand from the wire to the coating, or from the coating to the wire; for a- Ex- nts.

for without this precaution the phial would be diſcharged. By applying the outſide of the phial to the upper ſurface of the glaſs, in the manner above mentioned, the phial will be partly diſcharged on that ſurface: and though it muſt be therefore weakened, the power of the glaſs will be increaſed, and conſequently enabled to produce a proportionably ſtronger effect on the braſs cover, which by the next round of applications will give the phial a ſtronger charge than it had before. And thus a very ſmall degree of original power is firſt generated, and then employed in forming two different accumulations: and by making each of theſe ſubſervient to the increaſe of the other, the phial is at laſt fully charged, and the glaſs plate acquires ſuch a degree of the ſurcharge, as to give a pretty ſmart ſhock; and after that, it remains capable, by the influence of its permanent powers, of producing a ſucceſſion of poſitive and negative ſparks on the oppoſite ſurfaces.

“18. The contrary charge may be given to the phial by taking hold of the coating, and carrying the wire in contact over the middle of the upper ſurface of the glaſs, and by applying the power of the inſulated cover to the coating; for if the operation be conducted in every other reſpect in the ſame manner as before, then will the inſide be electrified poſitively, and the outſide negatively. The powers of the glaſs plate will be the ſame as they were in the former caſe.

“19 After the phial has been fully charged negatively, by the proceſs of the laſt experiment, let it be inſulated; and taking hold of the wire, let the bottom be held uppermoſt, and let the hand which holds it reſt on the fillet of tin-foil. Apply the inſulated cover to the glaſs, and after touching it with a finger of the other hand, ſeparate it from the glaſs; and on bringing it towards the coating of the phial, a ſtrong ſpark will paſs between them. After repeating this between 20 and 30 times, the powers of the phial will be deſtroyed; and by continuing the ſame operation, they will be inverted; for the inſide will be at laſt fully charged poſitively, and the outſide negatively.

“20. The ſame effect may be produced, by turning the glaſs over, and by repeatedly applying the influential electricity, produced on that ſide, to the wire of the phial.

“21. When the phial has been fully charged negatively, as in the laſt experiment, take hold of the coating of the phial with one hand, and while the other hand reſts on the tin-foil fillet, apply the wire to the middle of the upper ſurface of the glaſs, as far as the tin-foil coating extends on the other ſide. By this the powers of the glaſs plate will be changed.

“22 Another, and perhaps a better method of applying the phial, is to place the inſulated cover on the ſurface of the glaſs, and then holding the phial by the coating in one hand, to apply the wire to the cover, while the other hand touches the fillet of tin-foil; by which a ſhock will be given, and the ſame change of powers will be produced in an inſtant, which before took up ſome little time. On lifting the inſulated cover by its ſtem immediately after the ſhock, it will be negative, or have the ſame power as the inſide of the phial; but on replacing the cover, and completing the circuit of the glaſs plate, the ſurcharge will be deſtroyed; another ſhock will be felt; and the power of the cover, after the next ſeparation, will be poſitive, or contrary to that of the inſide of the phial. Apply this poſitive power to the wire of the phial as before; and after 15 applications, the powers of the phial will be deſtroyed: and by ſtill proceeding in the ſame manner, the powers of the phial will be changed, and the inſide will be fully charged poſitively and the outſide negatively, by 60 applications.

Miſcellaneous Experiments.

“23. Theſe effects may alſo be produced by a ſingle application of the coating of the phial to the other ſide of the glaſs plate; and by repeated applications of the influential electricity, produced on the ſame ſide, to the coating of the phial.

“24. If it were ſimply the object in this experiment to change the powers of the phial, the operation might then be conſiderably ſhortened, by completing the circuit of the phial, and conſequently deſtroying the whole ſurcharge: but it was intended to ſhow what effects might be produced, by oppoſing the contrary powers to each other; and by doing this it appears that either ſide of the glaſs plate can deſtroy the powers of the phial, and give it a contrary charge; that either ſide of the phial can alſo change the powers of the glaſs plate; and that the powers of the glaſs plate, thus inverted, can again deſtroy the powers of the phial, and give it a full charge of the contrary electricity.

“25. Here it may be obſerved, that, in ſome caſes, the quality of the power may be determined by obſervation alone. When the phial employed in the two laſt experiments has been fully charged, it may be known whether the inſide be poſitive or negative from the light which appears at the wire, or from the hiſſing noiſe which attends it: for when the phial has been fully charged poſitively, if the room be ſufficiently darkened, a bright luminous appearance may be ſeen, diverging in ſeparate rays to the diſtance of an inch, attended with an interrupted hiſſing noiſe; and both the light and the noiſe continue a very ſhort time. But when the phial is fully charged negatively, a weaker and more uniform light appears, which does not extend itſelf more than the ſixth part of an inch, and is attended with a cloſer and more uniform hiſſing; and this noiſe and light always continue longer than the former. Even poſitive and negative ſparks, paſſing between the inſulated cover and a finger, may be diſtinguiſhed from each other: for the poſitive ſparks are more divided, give leſs light, make a weaker ſnapping noiſe, and affect the finger leſs ſenſibly than the negative.

“26. The ſtrongeſt ſparks which can be produced in theſe experiments, are thoſe that paſs between the coating of the phial and the inſulated cover, when they poſſeſs contrary powers; but they will be more particularly vigorous, if the coating be poſitive and the inſulated cover negative.”

157 Mr Brookes's experiments on the Leyden-phial.

In Sect. vi. of this treatiſe we have related ſome experiments, tending to ſhow, that in the act of charging a phial with poſitive electricity, both became poſitive; and in the act of charging one negatively, both became negative. Theſe were inſerted in the former edition of this work; ſince which time Mr Brookes at Norwich has publiſhed a treatiſe; in which he not only adopts the opinion, but lays claim to it as his diſcovery, from ſome letters wrote in the year 1775. His experiments are extremely well adapted to elucidate the point intended; and the moſt remarkable of them are as follow:

Miſcellaneous Experiments.

“ 1. Let two pound phials be coated with tin-foil on their outſides, and filled to a convenient height with common ſhot. to ſerve as a coating within-ſide, as well as to keep a wire ſteady in the phials without a ſtopple in the mouth of them. Let each phial be furniſhed with a wire about the ſize of a gooſe-quill, and about ten inches long, and let each wire be ſharpened a little at one end, that it may the more eaſily be thruſt down into the ſhot, ſo as not to touch the glaſs any where at the mouth of the phials, yet ſo as to ſtand ſteadily in them. Let a metallic ball about ſix or ſeven eighths of an inch diameter be ſcrewed on at the other end of each wire: alſo let there be in readineſs a third wire, fitted up like thoſe for the phials, except that another ball of nearly the ſame ſize as the former may occaſionally be ſcrewed on over the ſharpened end of it. I ſay, inſtead of ſuſpending the phials from the prime conductor as before, let one of thoſe above deſcribed be charged at the prime conductor, and then ſet it aſide, but let it be in readineſs in its charged ſtate: then let the other be placed upon a good inſulating ſtand, and let the third wire alſo be laid upon the ſtand, ſo that its ball, or ſome part of the wire, may touch the coating of the phial. Let the ſharpened end of this wire project five or ſix inches over the edge of the ſtand: all of theſe being now placed cloſe to the edge of a table, hang a pair of cork balls on the ſharpened end of the wire, and make a communication from the prime conductor to the ball on the wire on the bottle: on working the machine, the ſharpened end of the wire will permit the bottle to be charged although it be inſulated; and if the wire be very finely pointed, the bottle may be charged nearly as well as if it were not inſulated: I ſay, on working the machine, the phial will charge, and the cork balls will immediately repel each other; but whilſt this phial is charging, take the firſt phial, which having been previouſly charged at the ſame prime conductor in the hand, and while the ſecond phial is charging, preſent the ball of the firſt to the cork balls, and they will all repel each other. This plainly proves that the outſide of the ſecond bottle is electrified plus at the time that it is charging, the ſame as the inſide of the firſt; and the inſide of both the bottles will readily be allowed to be charged alike, that is, plus or poſitive.

“ 2. Let the ſecond bottle in the laſt experiment be wholly diſcharged, and charge it again as before (the firſt bottle yet remaining charged), and whilſt it is charging, let the ball of the firſt approach the cork balls contiguous with the ſecond, and they will, as before, all repel each other: withdraw the ball of the firſt, and ſo long as the machine continues to charge the ſecond bottle higher, the cork balls will continue to repel each other; but ceaſe working the machine, and the cork balls will ceaſe to repel each other till they touch, and will then very ſoon repel each other again; then let the ball in the firſt phial approach the cork balls, and they will now be attracted by it, inſtead of being repelled as above, as in the laſt experiment. This alſo plainly ſhows, that both ſides of a Leyden phial are alike at the time it is charging; and at the ſame time evidently ſhows, that the difference of the two ſides does not take place till after the bottle is charged, or till the machine ceaſes to charge it higher.

Miſcell ous Ex ments.

“ 3. In this experiment, let both the former bottles be diſcharged, then let one of them be placed upon the inſulating ſtand. Let a ball be put on over the ſharpened end of the third wire, and let it be laid on the ſtand as before, ſo as to touch the coating of the phial: place the other phial on the table, ſo that its ball or wire may touch the ball on the third wire, or any part of the wire itſelf: make a communication from the ball on the wire of the firſt phial to the prime conductor: then, by working the machine, both bottles will ſoon become charged. As ſoon as they are pretty well charged, and before the machine ceaſe working, remove the ſecond phial from the third wire; after the ſecond phial is removed, ceaſe working the machine as ſoon as poſſible: take the third wire, with its two balls, off the ſtand with the hand, and lay it on the table, ſo that one of its balls may touch the outſide coating of the ſecond phial: remove the firſt phial off the ſtand, and place it on the table ſo as to touch the ball at the other end of the third wire; then, with an inſulated diſcharging rod, make a communication from the ball in one bottle to the ball in the other: if the outſide of the firſt phial be negative at the time it is charging, the inſide of the ſecond will be the ſame, and making the above communication would produce an exploſion, and both bottles would be diſcharged; but the contrary will happen, for there will be no exploſion, nor will either of the bottles be diſcharged, although there be a complete communication between their outſides, becauſe the inſide of them both will be poſitive. This is a proof, that conſidering one ſide of a phial to be poſitive and the other negative at the time they are charging, is a miſtake: as well as that, if any number of bottles be ſuſpended at the tail of each other, all the intermediate ſurfaces or ſides do not continue ſo.

“ 4. Here alſo let the apparatus be diſpoſed as in the laſt experiment, till the bottles are highly charged: then, with a clean ſtick of glaſs, or the like, remove the communication between the ball of the firſt phial and the prime conductor before the machine ceaſes working; then, with an inſulated diſcharging rod, make a communication from the outſide to the inſide of the firſt phial; a ſtrong exploſion will take place on account of the exceſs within-ſide, notwithſtanding they are both poſitive.

“ 5. This experiment being ſomething of a continuation of the preceding one, immediately after the laſt exploſion takes place, diſcharge the prime conductor of its electricity and atmoſphere; then touch the ball in the firſt phial with the hand, or any conducting ſubſtance that is not inſulated; then will the inſide coating of the firſt phial, which at firſt was ſo ſtrongly poſitive, be in the ſame ſtate as the outſide coating of the ſecond, having a communication by the hand, the floor, &c. with each other; that is, negative, if any thing can properly be called negative or poſitive that has a communication with the common ſtock: but a pair of cork balls that are electrified either plus or minus, will no more be attracted by either the inſide coating of the firſt phial or the outſide coating of the ſecond, than they will by the table on which they ſtand, or a common chair in the room, while they continue in that ſituation. Remove the aforeſaid communication from the ball of the firſt phial;

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phial; touch the ball in the ſecond, as before in the firſt, or diſcharge the bottle with the diſcharging rod, and the ball in the firſt bottle will immediately become negative: with a pair of cork balls, electrified negatively, approach the ball in the firſt phial, and they will all repel each other, or, if the cork balls be electrified poſitively, they will be attracted. All theſe circumſtances together ſeem fully to prove what has already been ſaid, not only that the inſide of the firſt phial, which was ſo ſtrongly poſitive, may be altered ſo as to become in the ſame ſtate as the outſide of the ſecond, without diſcharging the phial, or any more working the machine; but that it may be fairly changed, from being poſitively charged to being negatively charged. If a pair of cork balls are now hanged on to the ball of the wire in this phial, by the help of a ſtick of glaſs, they will repel each other, being negatively electrified. Make a communication from the outſide of the bottle to the table, and replace the communication from the prime conductor to the ball in the bottle; then, upon moderately working the machine to charge the bottle, the cork balls will ceaſe to repel each other till they touch, and will ſoon repel each other again by being electrified poſitively. Here the working the machine anew, plainly ſhows that the inſide of the firſt bottle, which was poſitive, was likewiſe changed to negative.

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"In making electrical experiments, and in particular thoſe in which the Leyden phial is concerned (a number of which together compoſe moſt electrical batteries), a method to preſerve the bottles or jars from being ſtruck through by the electric charge is very deſirable; but I do not know that it has hitherto been accompliſhed. The number of them that have been deſtroyed in the foregoing, as well as in many experiments made long before, have led me to various conjectures to preſerve them: at the ſame time I have been obliged to make uſe of bottles inſtead of open mouthed jars. And as coating the former within-ſide is very troubleſome, it has put me on thinking of ſome method more eaſy, quicker, and equally firm and good, as with the tin-foil. With reſpect to the new method of coating, I failed; though ſomething elſe preſented itſelf rather in behalf of the former: therefore introducing the proceſs here will not be of very great uſe; unleſs in ſaving another the trouble of making uſe of the ſame method, or giving a hint towards the former, ſo as to ſucceed with certainty. My aim was, to find ſomething that ſhould be quick and clean, and not eaſy to come off with the rubbing of wires againſt it, and yet a good conductor. My firſt eſſay was with a cement of pitch, roſin, and wax, melted together; into which, to make it a good conductor, I put a large proportion of finely ſifted braſs filings. When this mixture was cold, I put broken pieces of it into the bottle, and warmed the bottle till it was hot enough to melt the cement in it ſo as to run, and cover the bottle within-ſide; then I coated the outſide with tin-foil as is commonly done, and now it was fit for uſe, or ready to be charged: to which I next proceeded; and I believe I had not made more than four or five turns of the winch before it ſpontaneouſly ſtruck through the glaſs with a very ſmall charge. I then took off the outſide coating, and ſtopped the fracture with ſome of my common cement, after which I put the coating on again; and, in as little time as before, it was ſtruck through again in a different place: and thus I did with this bottle five or ſix times; ſometimes it ſtruck through the cement, but it ſtruck through the glaſs in four different places. This made me conſider what it might be that facilitated the ſpontaneous ſtriking through the glaſs, and likewiſe what might retard it. I had long before thought that jars or bottles appeared to be ſtruck through with a much leſs charge, juſt after their being coated, or before they were dry, than when they had been coated long enough for the moiſture to be evaporated from the paſte with which I moſtly lay on the tin-foil; and could only conſider the dry paſte as a kind of mediator between the tin-foil and the glaſs, or, in other words, that the moiſture in the paſte was a better conductor, and more in actual contact with the glaſs, than the paſte itſelf when dry. And the coating the bottles with the heated cement, though long afterward, did not alter my former idea; for it appeared as if the hot cement, with the conducting ſubſtance in it, might be ſtill more in actual contact with the glaſs than the moiſture in the paſte. On theſe probabilities I had to conſider what might act as a kind of mediator more effectually than the dry paſte between the glaſs and the tin-foil. It occurred, that common writing-paper, as being neither a good conductor nor inſulator, might be ſerviceable by being firſt paſted ſmoothly to the tin-foil and left to dry. The paper then being paſted on one ſide, having the tin-foil on the other, I put them on the glaſs together with the tin-foil outward, and rubbed them down ſmooth. This ſucceeded ſo well that I have never ſince had any ſtruck through that were thus done, either common phials, or large bottles which contain near three gallons each, though ſome of the latter have ſtood in the battery in common uſe with the other a long time. And as I have never had one ſtruck through that has been prepared in this way, I am much leſs able at preſent to tell how great a charge they will bear before they are ſtruck through, or whether they will be ſtruck through at all."

Miſcellaneous Experiments.

159
Glaſs eaſily broke by electricity when covered with cement.

160
Nicholſon's experiments on excitation, &c.

In the laſt part of the Philoſophical Tranſactions for 1789, we have the following experiments by Mr Nicholſon, on an improved method of excitation, as well as the action of points, and the direction of the fluid in poſitive and negative electricity.

"1. A glaſs cylinder was mounted, and a cuſhion applied with a ſilk flap, proceeding from the edge of the cuſhion over its ſurface, and thence half round the cylinder. The cylinder was then excited by applying an amalgamed leather in the uſual manner. The electricity was received by a conductor, and paſſed off in ſparks to Lane's electrometer. By the frequency of theſe ſparks, or by the number of turns required to cauſe ſpontaneous exploſion of a jar, the ſtrength of the excitation was aſcertained.

"2. The cuſhion was withdrawn about one inch from the cylinder, and the excitation performed by the ſilk only. A ſtream of fire was ſeen between the cuſhion and the ſilk; and much fewer ſparks paſſed between the balls of the electrometer.

" 3. A roll of dry ſilk was interpoſed, to prevent the ſtream from paſſing between the cuſhion and the ſilk. Very few ſparks then appeared at the electrometer.

" 4. A metallic rod, not inſulated, was then interpoſed inſtead of the roll of ſilk, ſo as not to touch any part of the apparatus. A denſe ſtream of electricity appeared between the rod and the ſilk, and the conductor gave very many ſparks.

" 5. The knob of a jar being ſubſtituted in the place of the metallic rod, it became charged negatively.

" 6. The ſilk alone, with a piece of tin-foil applied behind it, afforded much electricity, though leſs than when the cuſhion was applied with a light preſſure. The hand being applied to the ſilk as a cuſhion, produced a degree of excitation ſeldom equalled by any other cuſhion.

" 7. The edge of the hand anſwered as well as the palm.

" 8. When the excitation by a cuſhion was weak, a line of light appeared at the anterior part of the cuſhion, and the ſilk was ſtrongly diſpoſed to receive electricity from any uninſulated conductor. Theſe appearances did not obtain when the excitation was by any means made very ſtrong.

" 9. A thick ſilk, or two or more folds of ſilk, excited worſe than a ſingle very thin flap. I uſe the ſilk which the milliners call Perſian.

" 10. When the ſilk was ſeparated from the cylinder, ſparks paſſed between them; the ſilk was found to be in a weak negative, and the cylinder in a poſitive, ſtate.

161 The ſilk flap the principal cauſe of excitation.

" The foregoing experiments ſhow that the office of the ſilk is not merely to prevent the return of electricity from the cylinder to the cuſhion, but that it is the chief agent in the excitation; while the cuſhion ſerves only to ſupply the electricity, and perhaps increaſe the preſſure at the entering part. There likewiſe ſeems to be little reaſon to doubt but that the diſpoſition of the electricity to eſcape from the ſurface of the cylinder is not prevented by the interpoſition of the ſilk, but by a compenſation after the manner of a charge; the ſilk being then as ſtrongly negative as the cylinder is poſitive; and, laſtly, that the line of light between the ſilk and cuſhion in weak excitations does not conſiſt of returning electricity, but of electricity which paſſes to the cylinder, in conſequence of its not having been ſufficiently ſupplied during its contact with the rubbing ſurface.

" 11. When the excitation was very ſtrong in a cylinder newly mounted, flaſhes of light were ſeen to fly acroſs its inſide, from the receiving ſurface to the ſurface in contact with the cuſhion, as indicated by the bruſh figure. Theſe made the cylinder ring as if ſtruck with a bundle of ſmall twigs. They ſeem to have ariſen from part of the electricity of the cylinder taking the form of a charge. This appearance was obſerved in a 9-inch and a 12-inch cylinder, and the property went off in a few weeks. Whence it appears to have been chiefly occaſioned by the rarity of the internal air produced by handling, and probably reſtored by gradual leaking of the cement.

162 State of the inſide of a cylinder during excitation determined.

" 12. With a view to determine what happens in the inſide of the cylinder, recourſe was had to a plate machine. One cuſhion was applied with its ſilken flap. The plate was 9 inches in diameter and $\frac{2}{10}$ths of an inch thick. During the excitation, the ſurface oppoſite to the cuſhion ſtrongly attracted electricity, which it gave out when it arrived oppoſite to the extremity of the flap: ſo that a continual ſtream of electricity paſſed through an inſulated metallic bow terminating in balls, which were oppoſed, the one to the ſurface oppoſite the extremity of the ſilk, and the other oppoſite to the cuſhion; the former ball ſhowing poſitive and the latter negative ſigns. The knobs of two jars being ſubſtituted in the place of theſe balls, the jar applied to the ſurface oppoſed to the cuſhion was charged negatively, and the other poſitively. This diſpoſition of the back ſurface ſeemed, by a few trials, to be weaker the ſtronger the action of the cuſhion, as judged by the electricity on the cuſhion ſide.

" Hence it follows, that the internal ſurface of a cylinder is ſo far from being diſpoſed to give out electricity during the friction by which the external ſurface acquires it, that it even greedily attracts it.

" 13. A plate of glaſs was applied to the revolving plate, and thruſt under the cuſhion in ſuch a manner as to ſupply the place of the ſilk flap It rendered the electricity ſtronger, and appears to be an improvement of the plate machine; to be admitted if there were not eſſential objections againſt the machine itſelf.

" 14. Two cuſhions were then applied on the oppoſite ſurfaces with their ſilk flaps, ſo as to claſp the plate between them. The electricity was received from both by applying the finger and thumb to the oppoſite ſurfaces of the plate. When the finger was advanced a little towards its correſpondent cuſhion, ſo that its diſtance was leſs than between the thumb and its cuſhion, the finger received ſtrong electricity, and the thumb none; and, contrariwiſe, if the thumb were advanced beyond the finger, it received all the electricity, and none paſſed to the finger. This electricity was not ſtronger than was produced by the good action of one cuſhion applied ſingly.

" 15. The cuſhion in experiment 12. gave moſt electricity when the back ſurface was ſupplied, provided that ſurface was ſuffered to retain its electricity till the rubbed ſurface had given out its electricity.

163 No adv tage g by rubl two ſid of the plate m chine.

" From the two laſt paragraphs it appears, that no advantage is gained by rubbing both ſurfaces; but that a well managed friction on one ſurface will accumulate as much electricity as the preſent methods of excitation ſeem capable of collecting; but that, when the excitation is weak, on account of the electric matter not paſſing with ſufficient facility to the rubbed ſurface, the friction enables the oppoſite ſurface to attract or receive it, and if it be ſupplied, both ſurfaces will paſs off in the poſitive ſtate; and either ſurface will give out more electricity than is really induced upon it, becauſe the electricity of the oppoſite ſurface forms a charge. It may be neceſſary to obſerve, that I am ſpeaking of the facts or effects produced by friction; but how the rubbing ſurfaces act upon each other to produce them, whether by attraction or otherwiſe, we do not here enquire.

" It will hereafter be ſeen, that plate machines do not collect more electricity than cylinders (in the hands of the electrical operators of this metropolis) do with half the rubbed ſurface; which is a corroboration of the inference here made.

" 16. When a cylinder is weakly excited, the appearances mentioned (par. 8.) are more evident the more rapid

rapid the turning. In this caſe, the avidity of the ſurface of the cylinder beneath the ſilk is partly ſupplied from the edge of the ſilk, which throws back a broad caſcade of fire, ſometimes to the diſtance of above 12 inches. From theſe cauſes it is that there is a determinate velocity of turning required to produce the maximum of intenſity in the conductor. The ſtronger the excitation, the quicker may be the velocity; but it rarely exceeds five feet of the glaſs to paſs the cuſhion in a ſecond.

“ 17. If a piece of ſilk be applied to a cylinder, by drawing down the ends ſo that it may touch half the circumference, and the cylinder be then turned and excited by applying the amalgamed leather, it will become very greedy of electricity during the time it paſſes under the ſilk. And if the entering ſurface of the glaſs be ſupplied with electricity, it will give it out at the other extremity of contact; that is to ſay, if inſulated conductors be applied at the touching ends of the ſilk, the one will give, and the other receive, electricity, until the intenſities of their oppoſite ſtates are as high as the power of the apparatus can bring them; and theſe ſtates will be inſtantly reverſed by turning the cylinder in the oppoſite direction.

“ As this diſcovery promiſes to be of the greateſt uſe in electrical experiments, becauſe it affords the means of producing either the plus or minus ſtates in one and the ſame conductor, and of inſtantly repeating experiments with either power, and without any change of poſition or adjuſtment of the apparatus, it evidently deſerved the moſt minute examination.

“ 18. There was little hope (par. 6.) that cuſhions could be diſpenſed with. They were therefore added; and it was then ſeen, that the electrified conductors were ſupplied by the difference between the action of the cuſhion which had the advantage of the ſilk, and that which had not; ſo that the naked face of the cylinder was always in a ſtrong electric ſtate. Methods were uſed for taking off the preſſure of the receiving cuſhion; but the extremity of the ſilk, by the conſtruction, not being immediately under that cuſhion, gave out large flaſhes of electricity with the power that was uſed. Neither did it appear practicable to preſent a row of points or other apparatus to intercept the electricity which flew round the cylinder; becauſe ſuch an addition would have materially diminiſhed the intenſity of the conductor, which in the uſual way was ſuch as to flaſh into the air from rounded extremities of four inches diameter, and made an inch and half ball become luminous and blow like a point. But the greateſt inconvenience was, that the two ſtates with the backward and forward turn were ſeldom equal; becauſe the diſpoſition of the amalgam on the ſilk, produced by applying the leather to the cylinder in one direction of turning, was the reverſe of what muſt take place when the contrary operation was performed.

“ Notwithſtanding all this, as the intenſity with the two cuſhions was ſuch as moſt operators would have called ſtrong, the method may be of uſe, and I ſtill mean to make more experiments when I get poſſeſſion of a very large machine which is now in hand.

“ 19. The more immediate advantage of this diſcovery is, that it ſuggeſted the idea of two fixed cuſhions with a moveable ſilk flap and rubber. Upon this principle, which is ſo ſimple and obvious, that it is wonderful it ſhould have been ſo long overlooked, I have conſtructed a machine with one conductor, in which the two oppoſite and equal ſtates are produced by the ſimple proceſs of looſening the leather-rubber, and letting it paſs round with the cylinder (to which it adheres) until it arrives at the oppoſite ſide, where it is again faſtened. A wiſh to avoid prolixity prevents my deſcribing the mechaniſm by which it is let go and faſtened in an inſtant, at the ſame time that the cuſhion is made either to preſs or is withdrawn, as occaſion requires.

Miſcellaneous Experiments.

“ 20. Although the foregoing ſeries of experiments naturally lead us to conſider the ſilk as the chief agent in excitation; yet as this buſineſs was originally performed by a cuſhion only, it becomes an object of enquiry to determine what happens in this caſe.

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In what manner excitation is performed by a ſimple rubber without a ſilk flap.

“ 21. The great Beccaria inferred, that in a ſimple cuſhion, the line of fire, which is ſeen at the extremity of contact from which the ſurface of the glaſs recedes, conſiſts of returning electricity; and Dr Nooth grounded his happy invention of the ſilk flap upon the ſame ſuppoſition. The former aſſerts, that the lines of light both at the entering and departing parts of the ſurface are abſolutely ſimilar; and thence infers, that the cuſhion receives on the one ſide, as it certainly does on the other. I find, however, that the fact is directly contrary to this aſſertion; and that the oppoſite inference ought to be made, as far as this indication can be reckoned concluſive: for the entering ſurface exhibits many luminous perpendiculars to the cuſhion, and the departing ſurface exhibits a neat uniform line of light. This circumſtance, together with the conſideration that the line of light behind the ſilk in par. 8. could not conſiſt of returning electricity, ſhowed the neceſſity of farther examination. I therefore applied the edge of the hand as a rubber, and by occaſionally bringing forward the palm, I varied the quantity of electricity which paſſed near the departing ſurface. When this was the greateſt, the ſparks at the electrometer were the moſt numerous. But as the experiment was liable to the objection that the rubbing ſurface was variable, I paſted a piece of leather upon a thin flat piece of wood, then amalgamed its whole ſurface, and cut its extremity off in a neat right line cloſe to the wood. This being applied by the conſtant action of a ſpring againſt the cylinder, produced a weak excitation; and the line where the contact of the cylinder and leather ceaſed (as abruptly as poſſible) exhibited a very narrow fringe of light. Another piece of wood was prepared of the ſame width as the rubber, but one quarter of an inch thick, with its edges rounded, and its whole ſurface covered with tin-foil. This was laid on the back of the rubber, and was there held by a ſmall ſpring, in ſuch a manner as that it could be ſlided onward, ſo as occaſionally to project beyond the rubber, and cover the departing and excited ſurface of the cylinder without touching it. The ſparks at the electrometer were four times as numerous when this metallic piece was thus projected; but no electricity was obſerved to paſs between it and the cylinder. The metallic piece was then held in the hand to regulate its diſtance from the glaſs; and it was found, that the ſparks at the electrometer increaſed in number as it was brought nearer, until light appeared between the metal and the cylinder; at which time they became fewer the nearer it was brought, and at laſt ceaſed when it was in contact.

Miſcellaneous Experiments.

168 Concluſions from theſe experiments.

The following concluſions appear to be deducible from theſe experiments. 1. The line of light on a cylinder departing from a ſimple cuſhion conſiſts of returning electricity: 2. The projecting part of the cuſhion compenſates the electricity upon the cylinder, and by diminiſhing its intenſity prevents its ſtriking back in ſuch large quantities as it would otherwiſe do. 3. That if there was no ſuch compenſation, very little of the excited electricity would be carried off: And, 4. That the compenſation is diminiſhed, or the intenſity increaſed, in an higher ratio than that of the diſtance of the compenſating ſubſtance; becauſe if it were not, the electricity which has been carried off from an indefinitely ſmall diſtance, would never fly back from a greater diſtance and form the edge of light.

169 How to increaſe the intenſity of electricity to a great degree.

"22. I hope the conſiderable intenſity I ſhall ſpeak of will be an apology for deſcribing the manner in which I produce it. I wiſh the theory of this very obſcure proceſs were better known; but no conjecture of mine is worth mentioning. The method is as follows:

"Clean the cylinder, and wipe the ſilk.

"Greaſe the cylinder by turning it againſt a greaſed leather till it is uniformly obſcured. I uſe the tallow of a candle.

"Turn the cylinder till the ſilk flap has wiped off ſo much of the greaſe as to render it ſemitranſparent.

"Put ſome amalgam on a piece of leather, and ſpread it well, ſo that it may be uniformly bright. Apply this againſt the turning cylinder. The friction will immediately increaſe, and the leather muſt not be removed until it ceaſes to become greater.

"Remove the leather, and the action of the machine will be very ſtrong.

"My rubber, as before obſerved, conſiſts of the ſilk flap paſted to a leather, and the cuſhion is preſſed againſt the ſilk by a ſlender ſpiral ſpring in the middle of its back. The cuſhion is looſely retained in a groove, and reſts againſt the ſpring only, in ſuch a manner that by a ſort of libration upon it as a fulcrum, it adapts itſelf to all the irregularities of the cylinder, and never fails to touch it in its whole length. There is no adjuſtment to vary the preſſure, becauſe the preſſure cannot be too ſmall when the excitation is properly made. Indeed, the actual withdrawing of the cuſhion to the diſtance of $\frac{1}{10}$th of an inch from the ſilk, as in par. 2. will not materially affect a good excitation.

"The amalgam is that of Dr Higgins, compoſed of zinc and mercury. If a little mercury be added to melted zinc, it renders it eaſily pulverable, and more mercury may be added to the powder to make a very ſoft amalgam. It is apt to cryſtallize by repoſe, which ſeems in ſome meaſure to be prevented by triturating it with a ſmall proportion of greaſe; and it is always of advantage to triturate it before uſing.

"A very ſtrong excitation may be produced by applying the amalgamed leather to a clean cylinder with a clean ſilk: but it ſoon goes off, and is not ſo ſtrong as the foregoing, which laſts ſeveral days.

170 Effects of different cylinders excited in this manner.

"23. To give ſome diſtinctive criterions by which other electricians may determine whether the intenſity they produce exceeds or falls ſhort of that which this method affords, I ſhall mention a few facts.

"With a cylinder 7 inches diameter and cuſhion 8 inches long, three bruſhes at a time conſtantly flew out of a 3-inch ball in a ſucceſſion too quick to be counted, and a ball of $1\frac{1}{2}$ inch diameter was rendered luminous, and produced a ſtrong wind like a point. A 9 inch cylinder with an 8-inch cuſhion occaſioned frequent flaſhes from the round end of a conductor 4 inches diameter: with a ball of $2\frac{1}{3}$ inches diameter the flaſhes ceaſed now and then, and it began to appear luminous: a ball of $1\frac{1}{2}$ inch diameter firſt gave the uſual flaſhes; then, by quicker turning, it became luminous with a bright ſpeck moving about on its ſurface, while a conſtant ſtream of air ruſhed from it; and, laſtly, when the intenſity was greateſt, bruſhes of a different kind from the former appeared. Theſe were leſs luminous but better defined in the branches; many ſtarted out at once with a hoarſe ſound. They were reddiſh at the ſtem, ſooner divided, and were greeniſh at the point next the ball, which was braſs. A ball of $\frac{4}{10}$ths of an inch diameter was ſurrounded by a ſteady faint light, enveloping its exterior hemiſphere, and ſometimes a flaſh ſtruck out at top. When the excitation was ſtrongeſt, a few flaſhes ſtruck out ſideways. The horizontal diameter of the light was longeſt, and might meaſure one inch, the ſtem of the ball being vertical.

171 Surpriſi appeara on raiſi an elect cal kite.

"This laſt phenomenon is ſimilar to a natural event related by M. Loammi Baldwin*, who raiſed an electrical kite in July 1771 during the approach of a ſevere thunder-ſtorm, and obſerved himſelf to be ſurrounded by a rare medium of fire, which as the cloud roſe nearer the zenith, and the kite roſe higher, continued to extend itſelf with ſome gentle faint flaſhes. Mr Baldwin felt no other effect than a general weakneſs in his joints and limbs, and a kind of liſtleſs feeling; all which he obſerves might poſſibly be the effect of ſurpriſe, though it was ſufficient to diſcourage him from perſiſting in any farther attempt at that time. He therefore drew in his kite, and retired to a ſhop till the ſtorm was over, and then went to his houſe, where he found his parents and friends much more ſurpriſed than he had been himſelf; who, after expreſſing their aſtoniſhment, informed him, that he appeared to them (during the time he was raiſing the kite) to be in the midſt of a large bright flame of fire, attended with flaſhings: and that they expected every moment to ſee him fall a ſacrifice to the flame. The ſame was obſerved by ſome of his neighbours, who lived near the place where he ſtood.

"This fact is ſimilar to another obſerved by M. de Sauſſure on the Alps, and both are referable to my luminous ball with the ſecond kind of bruſh. The cloud muſt have been negative.

"With a 12-inch cylinder and rubber of $7\frac{1}{2}$ inches, a five-inch ball gave frequent flaſhes, upwards of 14 inches long, and ſometimes a 6 inch ball would flaſh. I do not mention the long ſpark, becauſe I was not provided with a favourable apparatus for the two larger cylinders. The 7-inch cylinder affords a ſpark of $10\frac{1}{2}$ inches at beſt. The 9-inch cylinder, not having its conductor inſulated on a ſupport ſufficiently high, afforded flaſhes to the table which was 14 inches diſtant. And the 12-inch cylinder, being mounted only as a model or trial for conſtructing a larger apparatus, is defective in ſeveral reſpects which I have not thought fit to alter. When the five-inch ball gives flaſhes, the cylinder is enveloped on all ſides with fire which ruſhes from the receiving part of the conductor. I

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* Memo of the A rican A demy, Vol. I. p 257.

I never uſe points, but in a ſimple machine bring the conductor almoſt in contact with the cylinder. In this apparatus that cuſhion to which the rubber is not applied ſerves that purpoſe.

"24. Theſe marks exhibit the intenſity as deduced from ſimple electriſying. I will now mention the rate of charging, which was nearly the ſame in all the three cylinders.

"A large jar of 350 ſquare inches, or near $2\frac{1}{2}$ ſquare feet, with an uncoated varniſhed rim of more than four inches in height, was made to explode ſpontaneouſly over the rim. The jar, when broken, proved to be 0.082 inches thick on an average; and the number of ſquare feet of the ſurface of the cylinder which was rubbed to produce the charge of one foot, was, when leaſt, 18.03, and when moſt, with good excitation, 19.34. The great machine at Haarlem charges a ſingle jar of one foot ſquare by the friction of 66.6 ſquare feet, and charges its battery of 225 ſquare feet at the rate of 94.8 ſquare feet rubbed for each foot. The intenſity of electricity on the ſurface of the glaſs is therefore conſiderably leſs than $\frac{1}{4}$th of that here ſpoken of; but if we take the moſt favourable number 66.6 at the commencement of turning, and halve it on account of the unavoidable imperfection of a plate machine (as ſhown in par. 14.), it will be found, that the management applied to that machine would cauſe a cylinder to charge one ſquare foot by the friction of $33\frac{1}{3}$ ſquare feet. It muſt be obſerved, however, that M. Van Marum's own machine, conſiſting of two plates 33 inches diameter, has only half the intenſity, though he reckons it a very good one. This machine is about equal in abſolute power to my 9-inch cylinder, with its ſhort rubber; but it is near 30 times as dear in price. In all theſe deductions I omit the computations, for the ſake of brevity, and becauſe they are eaſily made. The data are found in the deſcription of the Teylerian machine, and its continuation publiſhed at Haarlem in the years 1785 and 1787.

"I ſhall here take the liberty of obſerving, that the action of the cylinder, by a ſimple cuſhion or the hand, which excited the aſtoniſhment of all Europe, in the memory of our cotemporaries, was firſt improved by the addition of a leathern flap; then by moiſtening the rubber; afterwards by applying the amalgam; and, laſtly, by the addition of a ſilk flap. Now I find by experiment, that we at preſent obtain upwards of 40 times the intenſity which the bare hand produces; and conſequently, that, ſince 18 times our preſent intenſity will equal the utmoſt we can now condenſe on ſtrong glaſs even in the form of a charge, we have a leſs ſtep to take before we arrive at that amazing power than our immediate predeceſſors have already made. My 9-inch cylinder, when broken, proved to be $\frac{1}{21}$ of an inch thick.

"25. Some of the luminous appearances with balls in the poſitive ſtate, have been ſlightly noticed as criterions of intenſity. I ſhall here add, that the eſcape of negative electricity from a ball is attended with the appearance of ſtraight ſharp ſparks with a hoarſe or chirping noiſe. When the ball was leſs than two inches in diameter, it was uſually covered with ſhort flames of this kind, which were very numerous.

"26. When two equal balls were preſented to each other, and one of them was rendered ſtrongly poſitive, while the other remained in connection with the earth, the poſitive bruſh or ramified ſpark was ſeen to paſs from the electrified ball: when the other ball was electrified negatively, and the ball, which before had been poſitive, was connected with the ground, the electricity (paſſing the ſame way according to Franklin) exhibited the negative flame, or denſe, ſtraight, and more luminous ſpark, from the negative ball; and when the one ball was electrified plus and the other minus, the ſigns of both electricities appeared. If the interval was not too great, the long zig-zag ſpark of the plus ball ſtruck the ſtraight flame of the minus ball, uſually at the diſtance of about $\frac{1}{3}$d of the length of the latter from its point, rendering the other $\frac{2}{3}$ds very bright. Sometimes, however, the poſitive ſpark ſtruck the ball at a diſtance from the negative flame. Theſe effects are repreſented in Plate CLXXVIII. fig. 86, 87, 88.

Miſcellaneous Experiments.

"27. Two conductors of three-quarters of an inch diameter, with ſpherical ends of the ſame diameter, were laid parallel to each other, at the diſtance of about two inches, in ſuch a manner as that the ends pointed in oppoſite directions, and were ſix or eight inches aſunder. Theſe, which may be diſtinguiſhed by the letters *P* and *M*, were ſucceſſively electrified as the balls were in the laſt paragraph. When one conductor *P* was poſitive, fig. 90. it exhibited the ſpark of that electricity at its extremity, and ſtruck the ſide of the other conductor *M*. When the laſt mentioned conductor *M* was electrified negatively, fig. 89. the former being in its turn connected with the earth, the ſparks ceaſed to ſtrike as before, and the extremity of the electrified conductor *M* exhibited negative ſigns, and ſtruck the ſide of the other conductor. And when one conductor was electrified *plus* and the other *minus*, fig. 91. both ſigns appeared at the ſame time, and continual ſtreams of electricity paſſed between the extremities of each conductor to the ſide of the other conductor oppoſed to it. In each of theſe three caſes, the current of electricity, on the hypotheſis of a ſingle fluid, paſſed the ſame way.

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Of the diſpoſition of balls to receive electricity as their ſtems are long or ſhort.

"28. In drawing the long ſpark from a ball of four inches diameter, I found it of ſome conſequence that the ſtem ſhould not be too ſhort, becauſe the vicinity of the large prime conductor altered the diſpoſition of the electricity to eſcape: I therefore made a ſet of experiments, the reſult of which ſhowed, that the diſpoſition of balls to receive or emit electricity is greateſt when they ſtand remote from other ſurfaces in the ſame ſtate; and that between this greateſt diſpoſition in any ball, whatever may be its diameter, every poſſible leſs degree may be obtained by withdrawing the ball towards the broader or leſs convex ſurface out of which its ſtem projects, until at length the ball, being wholly depreſſed beneath that ſurface, loſes the diſpoſition entirely. From theſe experiments it follows, that a variety of balls is unneceſſary in electricity; becauſe any ſmall ball, if near the prime conductor, will be equivalent to a larger ball whoſe ſtem is longer.

177
Of the action of points.

"29. From comparing ſome experiments made by myſelf many years ago with the preſent ſet, I conſidered a point as a ball of an indefinitely ſmall diameter, and conſtructed an inſtrument conſiſting of a braſs ball of ſix inches diameter, through the axis of which a ſtem, carrying a fine point, was ſcrewed. When this ſtem

ſtem is fixed in the prime conductor, if the ball be moved on its axis in either direction, it cauſes the fine point either to protrude through a ſmall hole in its external ſurface, or to withdraw itſelf; becauſe by this means the ball runs along the ſtem. The diſpoſition of the point to tranſmit electricity may thus be made equal to that of any ball whatever, from the minuteſt ſize to the diameter of ſix inches. See fig. 92. *A*.

" 30. The action of pointed bodies has been a ſubject of diſcuſſion ever ſince it was firſt diſcovered, and is not yet well explained. To thoſe who aſcribe this effect to the figure of electric atmoſpheres, and their diſpoſition to fly off, it may be anſwered, that they ought firſt to prove their exiſtence, and then ſhow why the cauſe which accumulated them does not prevent their eſcape; not to mention the difficulty of explaining the nature of negative atmoſpheres. If theſe be ſuppoſed to conſiſt of electrified air, it will not be eaſy to ſhow why a current of air paſſing near a prime conductor does not deſtroy its effects. The opinion ſupported by the celebrated Volta and others, that a point is the coating to an infinitely ſmall plate of air, does not appear better founded: for ſuch a plate muſt be broken through at a greater diſtance only becauſe higher charged; whence it would follow, that points ſhould not act but at high intenſities I muſt likewiſe take notice, as a proof that the charge has little to do here, that if a ball be preſented to the prime conductor, at the ſame time that a point proceeds from the oppoſite ſide of the ball, the electricity will paſs by the point, though it is obliged to go round the ball for that purpoſe; but it can hardly be doubted, that whatever charge obtains in this caſe is on the ſurface of the ball next the conductor, and not on the remote ſide to which the electricity directs its courſe.

" 31. The pointed apparatus deſcribed (par. 29.) ſhows that the effect of points depends on the remoteneſs of their extremities from the other parts of the conductor. This leads to the following general law: *In any electrified conductor, the tranſition or eſcape of electricity will be made chiefly from that part of the ſurface which is the moſt remote from the natural ſtate.* Thus in the apparatus of the ball and ſtem, the point having a communication with the reſt of the whole conductor, conſtantly poſſeſſes the ſame intenſity; but the influence of the ſurrounding ſurface of the ball diminiſhes its capacity. This diminution is leſs the farther the ball is withdrawn, and conſequently the point will really poſſeſs more electricity, and be more diſpoſed to give it out when it is prominent than when depreſſed. The ſame explanation ſerves for negative electricity.

" 32. The effect of a poſitive ſurface appears to extend farther than that of a negative: for the point acts like a ball when conſiderably more prominent if it be poſitive than it will if negative.

" For the ſake of conciſeneſs, I paſs over many facts which have preſented themſelves in the courſe of my experiments on the two electricities, and content myſelf with obſerving, that there is ſcarcely any experiment made with the poſitive power, which will not afford a reſult worthy of notice, if repeated with the negative."

With regard to the direction of the electric fluid, we ſhall only farther take notice of two experiments, which have been thought to prove directly the paſſage of the fluid outward from the poſitive and inward to the negative ſide of the phial. Fig. 18. repreſents an electric jar, whoſe exterior coating is made up of ſmall pieces of tin-foil placed at a ſmall diſtance from each other. This jar is to be charged in the uſual manner, when ſmall ſparks of the electric fluid will paſs from one piece of tin-foil to the other, in various directions, forming a very pleaſing ſpectacle. The ſeparation of the tin-foil is the cauſe of this viſible paſſage of the fluid from the outſide to the table; and the experiment is ſimilar in appearance to that of the ſpiral tube mentioned in the foregoing ſection. If the jar be diſcharged by bringing a pointed wire gradually to the knob *I*, the unſealed part of the glaſs between the wire and knob will be agreeably illuminated with a crackling noiſe of the ſparks. If the jar be ſuddenly diſcharged, the whole outſide will be illuminated. The jar, in this experiment, muſt be very dry when uſed.

Plate CLXXI
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Conſtru tion of j to ſhow courſe c the elect fluid.

Fig. 19. repreſents two jars, or Leyden phials, placed one over the other, by which various experiments may be made in order to elucidate the common theory. Bring the outſide coating of the bottle *A* in contact with the prime conductor, and turn the machine till the bottle is charged; then place one ball of the diſcharging rod upon the coating of *B*, and with the other touch the knob of the jar *A*, which will cauſe an exploſion; now place one ball of the diſcharger on the knob *A*, and bring the other ball to its coating, and you have a ſecond diſcharge. Again, apply one ball of the diſcharger to the coating of *B*, and carry the other to the coating of *A*, and it will produce a third diſcharge. A fourth is obtained by applying the diſcharger from the coating of *A* to its knob. The outer coating of the under jar communicating with the inſide of the under one, conveys the fluid from the conductor to the large jar, which is therefore charged poſitively: the upper jar does not charge, becauſe the inſide cannot part with any of its electric fluid; but when a communication is formed from the outſide of *A* to the inſide of *B*, part of the fire on the inſide of *A* will be conveyed to the negative coating of *B*, and the jar will be diſcharged. The ſecond exploſion is occaſioned by the diſcharge of the jar *A*; but as the outſide of this communicates, by conducting ſubſtances, with the poſitive inſide of the jar *B*, if the ball of the diſcharging rod remains for a little time after the diſcharge on the knob of *A*, part of the fire of the inſide of *A* will eſcape, and be replaced by an equal quantity on the outſide from the jar *B*, by which means *A* is charged a ſecond time; the diſcharge of this produces the third, and of *B* the fourth exploſion.

Fig. 20. is an electric jar, which ſerves to illuſtrate the contrary ſtates of the ſide of a Leyden phial while charging. *B B* is the tin-foil coating; *C* a ſtand which ſupports the jar; *D* a ſocket of metal, carrying the glaſs rod *E*, a bent braſs wire pointed at each end, and fixed at the end of the rod *G*; which rod is moveable in the ſpring tube *N* at pleaſure: that tube being fixed by a ſocket on the top of the glaſs rod *E*, the jar is charged by the inſide wire, which communicates with the different diviſions of the inſide coating by horizontal wires.

Fig. 90. Fig. 88. Fig. 86.

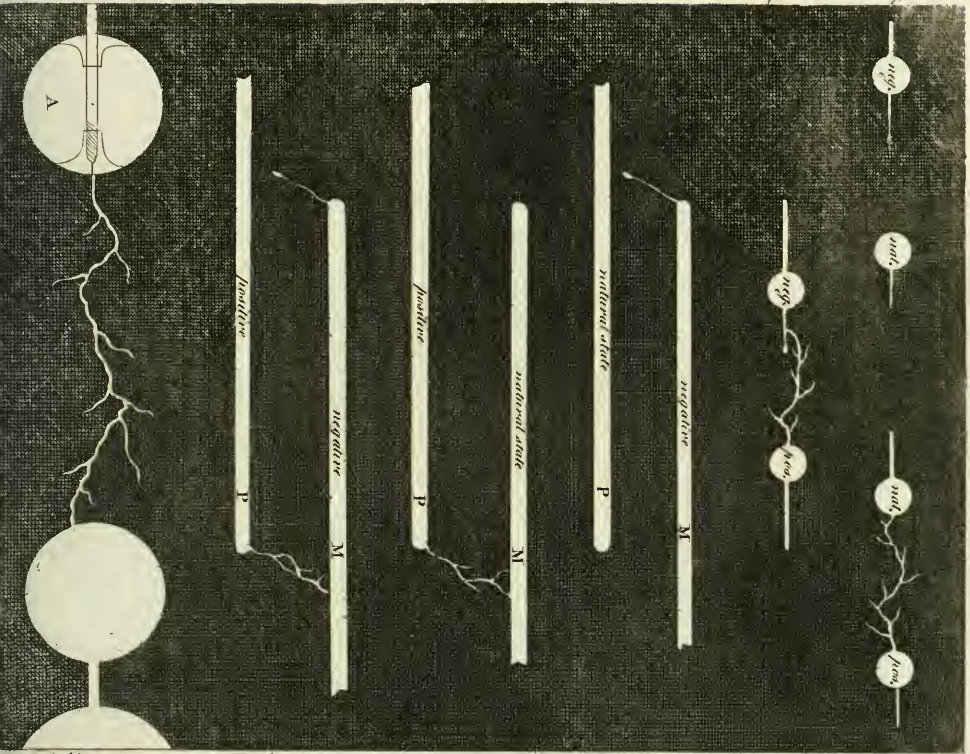


Fig. 92. Fig. 91. Fig. 89. Fig. 87.

Fig. 93.

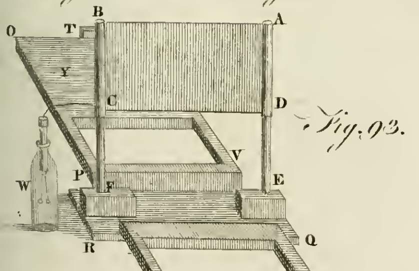
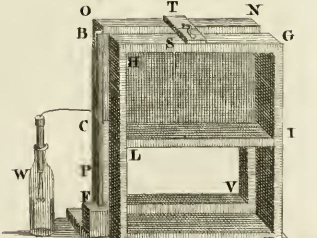


Fig. 94.



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Place the jar to the conductor as uſual; and, when charging, a luminous ſpeck will appear upon the upper point of the wire at *F*, clearly ſhowing, according to the commonly received opinion, that the point is then receiving the electric fluid. From the upper ring of coating *B*, on the outſide of the jar, a fine ſtream or pencil of rays will at the ſame time fly off, beautifully diverging from the lower point of the wire *F* upon the bottom ring of the coating of the jar. When the appearances ceaſe, which they do when the jar is charged, let a pointed wire be preſented towards the conductor: this will ſoon diſcharge the jar ſilently; during which the point will be illuminated with a ſmall ſpark, while the upper point of the wire will throw off a pencil of rays diverging towards the upper ring of the coating.

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We ſhall conclude this ſection with an account of ſome effects of the electrical fluid upon various elaſtic vapours. Theſe were tried to the greateſt advantage by Dr Van Marum with the great machine already mentioned: and for this purpoſe he uſed a cylindrical glaſs receiver five inches long and an inch and a quarter in diameter, into which different ſorts of elaſtic fluids were ſucceſſively inſerted, and were confined by quickſilver or water. To a hole made in the bottom of the inverted glaſs receiver an iron wire was faſtened, the external part of which communicated with a conductor, which being preſented to the prime conductor of the machine, received the ſparks from it. In this diſpoſition of the apparatus it evidently appears, that the ſparks paſſed through the elaſtic fluid contained in the receiver, by going from the inner extremity of the wire to the quickſilver or water in which the receiver was inverted. With this apparatus it was found, that dephlogiſticated air, obtained from mercurial red precipitate, loſt $\frac{1}{20}$th of its bulk; but its quality was not ſenſibly altered, as it appeared from examining it with the eudiometer. This experiment being repeated when the receiver was inverted in lime-water, and likewiſe in the infuſion of turnſole, there enſued no precipitation, no change of colour, nor any phlogiſtication of the air. On pouring out this air, the uſual ſmell of the electric fluid was perceived very ſenſibly.

Nitrous air was diminiſhed of more than the half of its original bulk; and in that diminiſhed ſtate, being mixed with common air, it occaſioned no red colour, nor any ſenſible diminution. It had loſt its uſual ſmell, and it extinguiſhed a candle. In paſſing the ſparks through the nitrous air, a powder is formed on the ſurface of the quickſilver, which is a part of that metallic ſubſtance diſſolved by the nitrous acid.

Inflammable air, obtained from iron and diluted vitriolic acid, communicated a little redneſs to the tincture of turnſole. The ſtream of electric fluid through this air appeared more red, and much larger, than in common air, being every where ſurrounded by a faint blue light.

The inflammable air, obtained from ſpirit of wine and vitriolic acid, was increaſed to about three times its original bulk, and loſt a little of its inflammability.

Fixed air, from chalk and vitriolic acid, was a little increaſed in bulk by the action of electricity; but it was rendered leſs abſorbable by water.

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Vitriolic acid air, obtained from vitriolic acid and charcoal, was diminiſhed a little, and black ſpots were formed on the inſide of the glaſs receiver. Afterwards it was obſerved, that only one-eighth part of the electrified elaſtic fluid was abſorbed by water. It extinguiſhed a candle, and had very little ſmell.

Marine acid air ſeemed to oppoſe in great meaſure the paſſage of the electric fluid; ſince the ſparks would not paſs through a greater length than 2½th inches of this air. It was conſiderably diminiſhed, but the reſt was readily abſorbed by water.

Spathous air was neither diminiſhed, nor any other way ſenſibly altered, by the electric ſparks.

Alkaline air, extracted from ſpirit of ſal ammoniac, was at firſt almoſt doubled in bulk; then it was diminiſhed a little; after which it remained without any augmentation or diminution. It became unabſorbable by water, and by the contact of flame it exploded, like a mixture of inflammable air and a good deal of common air.

Common air was laſtly tried, and it was found to give a little faint redneſs to the tincture of turnſole; becoming at the ſame time ſenſibly phlogiſticated. The experiment was repeated thrice at different times, and in each time after the electrization it was examined by the admixture of nitrous air in Mr Fontana's eudiometer, and it was compared with the ſame air not electrified; the latter always ſuffering the greateſt diminution. In the firſt experiment the diminutions were $\frac{145}{500}$ and $\frac{175}{500}$; in the ſecond, $\frac{159}{500}$ and $\frac{194}{500}$; and in the laſt, $\frac{149}{500}$ and $\frac{178}{500}$.

See *Aerology*, n° 77.

On attempting to repeat Mr Cavendiſh's experiment,* in which he produced the nitrous acid by a mixture of pure with phlogiſticated air; inſtead of a ſyphon, the Doctor made uſe of a glaſs tube $\frac{1}{6}$th part of an inch in diameter, cloſed at one end, into which an iron wire, $\frac{1}{150}$th of an inch in diameter, had been inſerted: into this tube, filled with mercury, and fixed in a vertical poſition, was introduced the air with which the experiment was to be tried. The dephlogiſticated air was obtained from red precipitate, and had been thoroughly purified by alkaline ſalts, from any acid it might have contained. With a mixture of 5 parts of this and 3 of common air, the tube was filled to the height of 3 inches, to which was added $\frac{5}{12}$ths of an inch of lixivium, of the ſame kind with that uſed by Mr Cavendiſh. The reſult was, that, after tranſmitting through the tube a continued ſtream of the electrical fluid during 15 minutes, 2 inches of the air were abſorbed by the lixivium: more air being introduced into the tube till it was filled to the height of 3 inches, when it was again electrified. This proceſs was repeated till 8$\frac{3}{4}$ths inches of air had been abſorbed by the lixivium: this was now examined, and found to be, in ſome degree, impregnated with the nitrous acid; but it was very far from being ſaturated. With the ſame lixivium, of which a quarter of an inch remained in the tube, the experiment was continued till 14 inches more of air had been abſorbed; but its diminution was not perceived to decreaſe, though the lixivium had now abſorbed 77 meaſures of air, each equal to its own; whereas, in the experiment related by Mr Cavendiſh, only 38 meaſures of air were abſorbed by the alkali. But notwithſtanding this

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greater abſorption, the lixivium was yet far from being ſaturated.

The experiment was repeated with pure air, produced by minium, moiſtened with the vitriolic acid, and deprived of its fixed air; ſeven parts of this were mixed with three of phlogiſticated air, and lixivium added to the height of ⅛th of an inch. Here, as in the former experiment, the diminution continued without any decreaſe; and the lixivium, after it had abſorbed 22¼th inches, and conſequently 178 times its own meaſure of air, was very far from being ſaturated with the nitrous acid.

On this Dr Van Marum wrote to Mr Cavendiſh; and finding, by his anſwer, that this gentleman had uſed pure air, obtained from a black powder produced by ſhaking mercury with lead, he requeſted to be informed of the proceſs by which it is generated: but Mr Cavendiſh, not chooſing to communicate this at preſent, he determined to defer the repetition of the experiment till this ingenious philoſopher ſhall have publiſhed his mode of obtaining the pure air uſed in it.

Our author then goes on to ſome experiments made by ſuffering the electric fluid to paſs in a continued ſtream through various kinds of air, incloſed for this purpoſe in the little glaſs tube uſed in the laſt experiments.

Pure air obtained the week before from red precipitate, being placed over mercury, and electrified for 30 minutes, was diminiſhed by ⅕th, the ſurface of the quickſilver ſoon began to be calcined, and towards the end of the experiment the glaſs tube was ſo lined with the calx as to ceaſe to be tranſparent. By introducing a piece of iron, the electric ſtream was made to paſs through the air without immediately touching the mercury; yet this was equally calcined. This phenomenon the Doctor aſcribes ſolely to the diſſolution of the pure air, the principle of which unites itſelf with the metal; as in theſe experiments the mercury had not acquired any ſenſible heat. Two inches and 3 quarters of the ſame kind of air being placed over water, and electrified in the ſame manner during half an hour, loſt a quarter of an inch; and being ſuffered to ſtand 12 hours in the tube, was found to have loſt ⅛th of an inch more. This was very nearly the ſame diminution of the air that had taken place when it was electrified over mercury; but, in this caſe, the proceſs appears to be more ſlow, and the detached principle not ſo readily abſorbed. The air remaining after theſe experiments, being tried by the eudiometer, did not differ from unelectrified pure air taken from the ſame receiver.

To determine whether the pure air retained any of the acid employed in its production, the Doctor repeated the experiment with air obtained from red precipitate, confined by an infuſion of turnſole, but could not perceive in it the leaſt change of colour. He alſo electrified air obtained from minium and the vitriolic acid, placed over ſome diluted vinegar of lead; but this was not rendered at all turbid.

Three inches of phlogiſticated air being electrified, during the firſt 5 minutes were augmented to 3⅛th inches, and in the next 10 minutes to 3¼th inches: ſome lixivium was then introduced to try whether this would abſorb it; but upon being electrified 15 minutes, the column roſe to the height of 3⅜th inches. It was ſuffered to ſtand in the tube till the next day, when it was found to have ſunk to its original dimenſions.

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Nitrous air, confined by lixivium, being electrified during half an hour, loſt 3 quarters of its bulk; the lixivium appeared to have abſorbed a great deal of nitrous acid; and the air remaining in the tube did not ſeem to differ from common phlogiſticated air. Some of the ſame nitrous air, confined by lixivium, was, by ſtanding 3 weeks, diminiſhed to half its bulk, and this reſiduum alſo proved to be phlogiſticated air. Thus electricity very ſpeedily effects that ſeparation of the nitrous acid from nitrous air, which is ſlowly produced by the lixivium alone.

Inflammable air obtained from ſteel-filings and the diluted vitriolic acid, being confined by an infuſion of turnſole, was electrified for 10 minutes without any change of colour in the infuſion, or any alteration in the bulk of the air. The tube being filled with the ſame air to the heighth of 2½ inches, and placed in diluted vinegar of lead, was expoſed to the electric ſtream during 12 minutes, in which time the incloſed air roſe to 5 inches; but the vinegar remained perfectly clear. Three inches of inflammable air obtained from a mixture of ſpirits of wine with oil of vitriol, on being electrified for 15 minutes, roſe to 10 inches; thus dilated, it loſt all its inflammability, and when nitrous air was added, no diminution enſued.

A column of alkaline air obtained by heat from ſpirit of ſal ammoniac, 3 inches high, was electrified 4 minutes, and roſe to 6 inches, but did not riſe higher when electrified 10 minutes longer. It appears that this air is not expanded more by the powerful electric ſtream from this machine than by the common ſpark. Water would not abſorb this electrified air, which was in part inflammable.

The tube, being filled to the height of an inch with ſpirit of ſal ammoniac, and inverted in mercury, was electrified 4 minutes; in which time the tube was filled with 8 inches of air, which proved to be equally inflammable, and as little abſorbed by water as the alkaline air. Hence Dr Van Marum conjectures that this air is only the volatile alkali rendered elaſtic.

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The following experiment is very curious, and may ſerve to illuſtrate ſome phenomena obſerved in thunder-ſtorms. Two balloons, made of the allantoides of a calf, were filled with inflammable air, of which each contained about 2 cubic feet. To each of theſe was ſuſpended, by a ſilken thread about 8 feet long, ſuch a weight as was juſt ſufficient to prevent it from riſing higher in the air; they were connected, the one with the poſitive, the other with the negative conductor, by ſmall wires about 30 feet in length, and being kept near 20 feet aſunder, were placed as far from the machine as the length of the wires would admit. On being electrified, theſe balloons roſe up in the air as high as the wire allowed, attracted each other, and uniting as it were into one cloud, gently deſcended. The riſing of theſe artificial clouds is aſcribed to the expanſion of the air they contained, in conſequence of the repulſive force communicated to its particles by elec-

electricity: when in contact, their oppoſite electrical powers deſtroyed each other, and they recovered their ſpecific gravity by loſing the cauſe of its diminution. In order to render this experiment more perfectly imitative, the Doctor ſuſpended to the balloon which was connected with the negative conductor, a bladder filled with a mixture of inflammable and atmoſpherical air, which, being kindled by the ſpark that took place on the union of theſe clouds, gave a conſiderable exploſion. From theſe experiments, the Doctor explains the ſudden elevation of the clouds, and the violent ſhowers of rain and hail, which often accompany thunder-ſtorms.

In the courſe of his experiments upon air and electric fluid, Dr Prieſtley found, that, by means of the ſpark, he was able to turn vegetable blues to a red colour; though we are not to imagine that this was any indication of the acidity of the electric fluid, but merely of the decompoſition of the air, and its converſion into fixed air or aerial acid. The inſtrument uſed in this experiment is a glaſs tube about 4 or 5 inches long and 1 or $\frac{2}{10}$ths of an inch diameter in the inſide; a piece of wire is put into one end of the tube, and fixed there with cement; a braſs ball is placed on the top of this wire; the lower part of the tube is to be filled with water, tinged blue with a piece of turnſole or archil. This is eaſily effected, by ſetting the tube in a veſſel of the tinged water, then placing it under a receiver on the plate of the air-pump; exhauſt the receiver in part, and then, on letting in the air, the tinged liquor will riſe in the tube, and the elevation will be in proportion to the accuracy of the vacuum; now take the tube and veſſel from under the receiver, and throw ſtrong ſparks on the braſs ball from the prime conductor.

When Dr Prieſtely made this experiment, he perceived, that after the electric ſpark had been taken between the wire and the liquor about a minute, the upper part of it began to look red; in 2 minutes it was manifeſtly ſo, and the red part did not readily mix with the liquor. If the tube was inclined when the ſparks were taken, the redneſs extended twice as far on the lower ſide as on the upper. In proportion as the liquor became red, it advanced nearer to the wire, ſo that the air in which the ſparks were taken was diminiſhed; the diameter amounted to about $\frac{1}{5}$th of the whole ſpace; after which, a continuance of the electrification produced no ſenſible effect.

To determine whether the cauſe of the change of colour was in the air or in the electric matter, Dr Prieſtley expanded the air in the tube by means of an air-pump, till it expelled all the liquor, and admitted freſh blue liquor in its place: but after this, electricity produced no ſenſible effect on the air or on the liquor; ſo that it was clear, that the electric matter had decompoſed the air, and made it depoſit ſomething of an acid nature. The reſult was the ſame with wires of different metals. It was alſo the ſame when, by means of a bent tube, the ſpark was made to paſs from the liquor in one leg to the liquor in the other. The air thus diminiſhed was in the higheſt degree noxious.

In paſſing the electric ſpark through different elaſtic fluids, it appears of different colours. In fixed air, the ſpark is very white; in inflammable and alkaline air, it appears of a purple or red colour. From hence we may infer, that the conducting power of theſe airs is different, and that fixed air is a more perfect non-conductor than inflammable air.

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The ſpark was not viſible in air from a cauſtic alkali made by M. Lane, nor in air from ſpirit of ſalt; ſo that they ſeem to be more perfect conductors of electricity than water or other fluid ſubſtances.

The electric ſpark, taken in any kind of oil, produces inflammable air. Dr Prieſtley tried it with ether, oil of olives, oil of turpentine, and eſſential oil of mint, taking the electric ſpark in them without any air to begin with; inflammable air was produced in them all.

Dr Prieſtley found, that on taking a ſmall electric exploſion for an hour, in the ſpace of an inch of fixed air, confined in a glaſs tube $\frac{1}{10}$th of an inch diameter, when water was admitted to it, only $\frac{1}{4}$th of the air was imbibed. Probably the whole would have been rendered immiſcible in water, if the electrical operation had been continued a ſufficient time.

The electric ſpark, when taken in alkaline air, appears of a red colour; the electric exploſions, which paſs through this air, increaſe its bulk; ſo that, by making about 200 exploſions in a quantity of it, the original quantity will be ſometimes increaſed $\frac{1}{4}$th. If water is admitted to this air, it will abſorb the original quantity, and leave about as much elaſtic fluid as was generated by the electricity, and this elaſtic fluid is a ſtrong inflammable air.

Dr Prieſtley found, when the electric ſpark was taken in vitriolic acid air, that the inſide of the tube in which it was confined was covered with a blackiſh ſubſtance. He ſeems to think, that the whole of the vitriolic acid air is convertible into this black matter, not by means of any union which it forms with the electric fluid, but in conſequence of the concuſſion given to it by the exploſion; and that, if it be the calx of the metal which ſupplied the phlogiſton, it is not to be diſtinguiſhed from what metal, or indeed from what ſubſtance of any kind, the air had been extracted.

Dr Prieſtley made 150 exploſions of a common jar in about a quarter of an ounce meaſure of vitriolic acid air from copper, by which the bulk was diminiſhed about $\frac{1}{3}$, and the remainder ſeemingly not changed, being all abſorbed by water. In the courſe of this proceſs, the air was carefully transferred three times from one veſſel to another; and the laſt veſſel, in which the exploſions were made, was, to all appearance, as black as the firſt; ſo that the air ſeems to be all convertible into this black ſubſtance.

Thinking this diminution of the vitriolic acid air might ariſe from its abſorption by the cement with which the glaſs tubes employed in the laſt experiment were cloſed, he repeated it with the air from quickſilver, in a glaſs ſyphon confined by quickſilver, and the reſult was the ſame.

That this matter comes from the vitriolic acid air only, and not from any combination of the electric matter with it, will appear from the following experiment.

He took the ſimple electric ſpark from a conductor of a moderate ſize, for the ſpace of 5 minutes without interruption, in a quantity of vitriolic acid air,

air, without producing any change in the inſide of the glaſs; when immediately after, making in it only two exploſions of a common jar, each of which might be produced in leſs than a quarter of a minute with the ſame machine in the ſame ſtate, the whole of the inſide of the tube was completely covered with the black matter. Now, had the electric matter formed any union with the air, and this black matter had been the reſult of that combination, all the difference that would have ariſen from the ſimple ſpark or the exploſion, could only have been a more gradual or a more ſudden formation of that matter.

A large phial, about an inch and a half wide, being filled with this air, the exploſion of a very large jar, containing more than 2 feet of coated ſurface, had no effect upon it; from which it ſhould ſeem, that in theſe caſes the force of the ſhock was not able to give the quantity of air ſuch a concuſſion as was neceſſary to decompoſe any part of it.

He had generally made uſe of copper, but afterwards he procured this air from almoſt every ſubſtance from which it could be obtained; the electric exploſion taken in it produced the ſame effect. But as ſome of the experiments were attended with peculiar circumſtances, he briefly mentions them as follows.

When he endeavoured to get vitriolic acid air from lead, putting a quantity of leaden ſhot into a phial containing oil of vitriol, and applying only the uſual degree of heat, a conſiderable quantity of heat was produced; but afterwards, though the heat was increaſed till the acid boiled, no more air could be got. He imagined, therefore, that in this caſe the phlogiſton had in fact been ſupplied by ſomething that had adhered to the ſhot. However, in the air ſo produced, he took the electric exploſion; and in the firſt quantity he tried, a whitiſh matter was produced, almoſt covering the inſide of the tube; but in the ſucceeding experiments, with air produced from the ſame ſhot or from ſomething adhering to it, there was leſs of the whitiſh matter; and at laſt nothing but black matter was produced, as in all the other experiments. Water being admitted to this air, there remained a conſiderable reſiduum, which was very ſlightly inflammable.

Vitriolic acid air is eaſily procured from ſpirit of wine, the mixture becoming black before any air is yielded. The electric exploſion taken in this air alſo produced the black matter.

The experiments made with ether ſeem to throw moſt light upon this ſubject, as this air is as eaſily procured from ether as any other ſubſtance containing phlogiſton. In the air procured by ether the electric exploſion tinged the glaſs very black, more ſo than in any other experiment of the kind; and when water had abſorbed what it could of this air, there was a reſiduum in which a candle burned with a lambent blue flame. But what was moſt remarkable in this experiment was, that beſides the oil of vitriol becoming very black during the proceſs, a black ſubſtance, and of a thick conſiſtence, was formed, which ſwam on the ſurface of the acid.

It is very poſſible, that the analyſis of this ſubſtance may be a means of throwing light upon the nature of the black matter formed by electric exploſions in vitriolic acid air, as they ſeem to reſemble one another very much.

The electric ſpark or exploſion taken in common air, confined by quickſilver in a glaſs tube, covers the inſide of the tube with a black matter, which, when heated, appears to be pure quickſilver. This, therefore, may be the caſe with the black matter into which he ſuppoſed the vitriolic acid air to be converted by the ſame proceſs, though the effect was much more remarkable than in the common air. The exploſion will often produce the diminution of common air in half the time that ſimple ſparks will do it, the machine giving the ſame quantity of fire in the ſame time: alſo, the blackneſs of the tube is much ſooner produced by the ſhocks than by the ſparks. When the tube conſiderably exceeds $\frac{1}{15}$ths of an inch in diameter, it will ſometimes become very black, without any ſenſible diminution of the quantity of air.

## SECT. X. *Of the Methods of meaſuring Electricity both artificial and natural; of condenſing and doubling it, ſo that the ſmalleſt Quantity may be made perceptible; of diſtinguiſhing the two Kinds of Electricity from one another*, &c.

WE have already had occaſion to mention, and in part to explain, the inſtruments for this purpoſe named *electrometers*. When the electricity is very evident, many obvious contrivances may be fallen upon to determine its quality and ſtrength, when compared with that of any other body electrified alſo to a conſiderable degree. But in many caſes the quantity of electricity is ſo ſmall that it does not diſcover itſelf by any of the ordinary electrometers; and in others, though the quantity be very great, yet we are deſtitute of any proper ſtandard which might enable us to compare it with another of apparently the ſame height, or which might determine the degrees of charge which the electrified ſubſtance progreſſively receives.

Deſcrip of vari electro ters.

In the former caſe, Dr Prieſtley recommends a ſingle thread of ſilk as it comes from the worm; which being extremely light and flexible, very readily diſcovers the electric properties of any body, by being firſt attracted and then repelled by it: and, as this ſubſtance at the ſame time has a power of retaining its electricity very ſtrongly, we have thus an opportunity of determining whether the body from which it received the electricity was poſitive or negative. Even this electrometer has not been found to be endowed with all the ſenſibility to be wiſhed for; ſo that others have been contrived which anſwer to a ſtill greater degree of exactneſs. For ordinary purpoſes the following inſtruments are moſt commonly made uſe of.

Pla CLX

Fig. 13. repreſents a ſtand ſupporting the electrometers *D D*, *C C*. *B* is the baſis of it, made of common wood. *A* is a pillar of wax, glaſs, or baked wood. To the top of the pillar, if it be of wax or glaſs, a circular piece of wood is fixed; but if the pillar be of baked wood, that may conſtitute the whole. From this circular piece of wood proceed four arms of glaſs, or baked wood, ſuſpending at their ends four electrometers, two of which *DD* are ſilk threads about eight inches long, ſuſpending each a ſmall downy feather

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ricity,

feather at its end. The other two electrometers *CC* are thoſe with very ſmall balls of cork, or of the pith of alder; and they are conſtructed in the following manner. *a b* is a ſtick of glaſs about ſix inches long, covered with ſealing-wax, and ſhaped at top in a ring: from the lower extremity of this ſtick proceed two fine linen threads (K) *c c* about five inches long, each ſuſpending a cork or pith-ball *d* about $\frac{1}{8}$th of an inch in diameter. When this electrometer is not electrified, the threads *c c* hang parallel to each other, and the cork-balls are in contact; but when electrified, they repel one another, as repreſented in the figure. When it happens to be inconvenient to uſe the inſulating ſtand *A B*, the electrometers may be eaſily ſupported by a glaſs rod or tube.

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XIV.

Another ſpecies of the above electrometer is repreſented in fig. 14. which conſiſts of a linen thread, having at each end a ſmall cork-ball. This electrometer is ſuſpended by the middle of the thread on any conductor proper for the purpoſe, and ſerves to ſhow the kind and quantity of its electricity.

Fig. 15. repreſents Mr Henly's quadrant electrometer fixed upon a ſmall ſtand, from which it may be occaſionally ſeparated and fixed upon the prime conductor, or in any other place, at pleaſure. This electrometer conſiſts of a perpendicular ſtem formed at the top like a ball, and furniſhed at its lower end with a braſs ferule, by which it may be fixed in one of the holes of the prime conductor, or in its proper ſtand, as occaſion requires. To the upper part of the ſtem or pillar, a graduated ivory ſemicircle is fixed; about the middle of which is a braſs arm, which contains a pin, or the ſmall axis of the index. The index conſiſts of a very ſlender ſtick which reaches from the centre of the graduated ſemicircle to the braſs ferule, and at its lower extremity is faſtened a ſmall cork-ball, nicely turned in a lathe.

When this electrometer is not electrified, the index hangs parallel to the pillar; but when it is electrified, the index recedes more or leſs, according to the quantity of electricity from the ſtem. See *FGDI*, in fig. 14. and *ab* in fig 6. both of which are new and improved ways of applying it; by which the quantity of the ſhocks are regulated in the moſt convenient manner, as will be more particularly explained under *Medical* ELECTRICITY, Sect. XI.

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Fig 16. and 17. repreſent an electrometer nearly ſimilar to that contrived by Mr Brooke. The two inſtruments are ſometimes combined in one, or uſed ſeparately, as in theſe figures. The arms *FHfk*, fig. 17. when in uſe, are to be placed as much as poſſible out of the atmoſphere of a jar, battery, prime conductor, &c. The arm *FH* and the ball *K* are made of copper, and as light as poſſible. The diviſions on the arm *FH* are each of them exactly a grain. They are aſoertained at firſt by placing grain weights on a braſs ball which is within the ball *L* (this ball is an exact counterbalance to the arm *FH* and the ball *K* when the ſmall ſlide on this arm is at the firſt diviſion); and then removing the ſlide till it, together with the ball *K*, counterbalances the ball *L* and the weight laid on it.

*A*, fig. 16. is a dial-plate, divided into 90 equal parts. The index of this plate is carried once round, when the arm *BC* has moved through 90 degrees, or a quarter of a circle. That motion is given to the index by the repulſive power of the charge acting between the ball *D* and the ball *B* *.

Methods of meaſuring Electricity, &c.

The arm *BC* being repelled, ſhows when the charge is increaſing, and the arm *FH* ſhows what this repulſive power is between two balls of this ſize in grains, according to the number the weight reſts at when lifted up by the repulſive power of the charge: at the ſame time the arm *BC* points out the number of degrees to which the ball *B* is repelled; ſo that, by repeated trials, the number of degrees, anſwering to a given number of grains, may be aſcertained, and a table formed from theſe experiments, by which means the electrometer, fig. 16. may be uſed without that of fig. 17.

Mr Brookes thinks, that no glaſs charged (as we call it) with electricity, will bear a greater force than that whoſe repulſive power, between two balls of the ſize he uſed, is equal to 60 grains; that in very few inſtances it will ſtand 60 grains weight; and he thinks it hazardous to go more than 45 grains.

Hence, by knowing the quantity of coated ſurface, and the diameter of the balls, we may be enabled to ſay, ſo much coated ſurface, with a repulſion between balls of ſo many grains, will melt a wire of ſuch a ſize, or kill ſuch an animal, &c.

Mr Brookes thinks, that he is not acquainted with all the advantages of this electrometer; but that it is clear, it ſpeaks a language which may be univerſally underſtood, which no other will do; for though other electrometers will ſhow whether a charge is greater or leſs, by an index being repelled to greater or ſmaller diſtances, or by the charge exploding at different diſtances, yet the power of the charge is by no means aſcertained: but this electrometer ſhows the force of the repulſive power in grains; and the accuracy of the inſtrument is eaſily proved, by placing the weights on the internal ball, and ſeeing that they coincide with the diviſions on the arm *FH*, when the ſlide is removed to them.

Mr Achard has ſhown clearly, that if the ſcale of an electrometer is divided into equal parts (degrees for example), the angle at which the index is held ſuſpended by the electric repulſion will not be a true meaſure of the repulſive force; to eſtimate which truly, he demonſtrates that the arc of the electrometer ſhould be divided according to a ſcale of arcs, the tangents of which are in arithmetical progreſſion.

The electrometer of which this is an imitation was invented by Mr Brookes, and deſcribed in his treatiſe already quoted. An account of it is given in that treatiſe, along with a very full repreſentation of it by plates; but as theſe are ſomewhat difficult to be underſtood, we muſt for further particulars refer to the treatiſe itſelf. On this electrometer, however, we muſt obſerve, that it is conſtructed on the only true principle on which machines for meaſuring the quantity of electricity can be made. The mere attraction of any light body ſhows indeed that the ſubſtance which attracts it is electrified; but this property is by no means calculated to diſcover the comparative ſtrength of it, on account

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* Phil. Tran. vol. lxxxii. p. 384.

(K) Theſe threads ſhould be wetted in a weak ſolution of ſalt.

count of its continual variation. Thus, if we hold any body within the electrified atmoſphere of another, though it be firſt attracted pretty ſtrongly, yet that attraction will be conſtantly diminiſhing, and at laſt changed into a repulſive power; but the latter, after it has once taken place, continues invariable as long as any degree of electric charge remains.

184
Mr Cavallo's atmoſpherical electrometer.

The electricity of the atmoſphere particularly, has engaged the attention of philoſophers; and by reaſon of its infinite variety, requires the moſt delicate inſtruments to obſerve its minutiæ. Beſides the kite formerly deſcribed, which was an invention of Dr Franklin's, Mr Cavallo has invented ſeveral others. Fig. 61. repreſents a portable atmoſpherical electrometer, the principal part of which is a glaſs tube *CDMN*, cemented at the bottom into the braſs piece *AB*, by which part the inſtrument is to be held when uſed for the atmoſphere; and it alſo ſerves to ſcrew the inſtrument into its braſs caſe *ABO*, fig. 69. The upper part of the tube *CDMN* is ſhaped tapering to a ſmall extremity, which is entirely covered with ſealing-wax; to this tapering part a ſmall tube is cemented; the lower extremity, being alſo covered with ſealing-wax, projects a ſmall way within the tube *CDMN*; into this ſmaller tube a wire is cemented, which with its under extremity touches the flat piece of ivory *H*, faſtened to the tube by means of a cork; the upper extremity of the wire projects about a quarter of an inch above the tube, and ſcrews into the braſs cap *EF*, which cap is open at the bottom, and ſerves to defend the waxed part of the inſtrument from the rain, &c.

*IM* and *KN* are two narrow ſlips of tin-foil, ſtuck to the inſide of the glaſs *CDMN*, and communicating with the braſs bottom *AB*. They ſerve to convey that electricity which, when the balls touch the glaſs, is communicated to it, and being accumulated, might diſturb the free motion of the balls.

To uſe this inſtrument for artificial electricity, electrify the braſs cap by an electrified ſubſtance, and the divergence or convergence of the balls of the electrometer, at the approach of an excited electric, will ſhow the quality of the electricity. The beſt manner to electrify this inſtrument is, to bring excited wax ſo near the cap that one or both of the corks may touch the ſide of the bottle *CDMN*, after which they will ſoon collapſe and appear unelectrified. If now the wax is removed, they will again diverge, and remain electrified poſitively.

When this electrometer is to be uſed to try the electricity of the fogs, air, clouds, &c. the obſerver is to do nothing more than to unſcrew it from its caſe, and hold it by the bottom *AB* to preſent it to the air a little above his head, ſo that he may conveniently ſee the balls *P*, which will immediately diverge if there is any electricity; i. e. whether poſitive or negative may be aſcertained, by bringing an excited piece of ſealing-wax or other electric towards the braſs cap *EF*.

185
M. Sauſſure's improvement on this electrometer.

An improvement of Mr Cavallo's electrometer has been made by M. Sauſſure. The principal circumſtances in which they differ are, 1. The fine wires by which the balls are ſuſpended, ſhould not be long enough to reach the tin-foil which is paſted on the inſide of the glaſs; becauſe the electricity, when ſtrong, will cauſe them to touch this tin-foil twice conſecutively, and thus deprive them in a moment of their electricity. To prevent this defect, and yet give them a ſufficient degree of motion, it is neceſſary to uſe larger glaſſes than thoſe that are generally applied to Mr Cavallo's electrometer; two or three inches diameter will be found to anſwer the purpoſe very well. But as it is neceſſary to carry off the electricity which may be communicated to the inſide of the glaſs, and thus be confounded with that which belongs to thoſe ſubſtances that are under examination; four pieces of tin-foil ſhould be paſted on the inſide of the glaſs; the balls ſhould not be more than $\frac{1}{20}$th of an inch diameter, ſuſpended by ſilver wire, moving freely in holes nicely rounded. The bottom of the electrometer ſhould be of metal; for this renders it more eaſy to deprive them of any acquired electricity, by touching the bottom and top at the ſame time.

186
Serves ſtead o Volta's denſer.

This electrometer may be uſed inſtead of the condenſer of M. Volta, by only placing it on a piece of oiled ſilk, ſomewhat larger than the baſe of the inſtrument: but in this caſe it is the baſe and not the top of the inſtrument, which muſt be brought into contact with the ſubſtance whoſe electricity is to be explored.

187
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By this inſtrument, it is eaſy to aſcertain the degree of conducting power in any ſubſtance. For example, if it is placed on an imperfect conductor, as dry wood or marble, and if the inſtrument is electrified ſtrongly, and afterwards the top is touched, the electricity will appear to be deſtroyed; but on lifting up the inſtrument by the top, the balls will again open, becauſe the imperfect conductor formed with the baſe a kind of electrophorus, by which the electric fluid was condenſed, and loſt its tenſion, till the perfect conductor was ſeparated from the imperfect one; whereas, if the conductor had been more perfect, it would have been deprived of its electricity immediately on the application of the hand.

18
Or the lectrici

It is eaſy to diſcover alſo, by this inſtrument, the electricity of any ſubſtance, as of cloaths, hair of different animals, &c. For this purpoſe, it muſt be held by the baſe, and the ſubſtance rubbed briſkly (only once) by the ball of the electrometer; the kind of electricity may be aſcertained in the uſual manner. It is proper, however, to obſerve here, that as the top of the electrometer acts in this caſe as an inſulated rubber, the electricity it acquires is always contrary to that of the rubbed body.

18
How t collect great q tity of moſphe cal elec city,

In order to collect a great quantity of electricity from the air, the electrometer is furniſhed with a pointed wire 15 inches or two feet long, which unſcrews in three or four pieces, to render the inſtrument more portable; ſee fig. 62. When it rains or ſnows, the ſmall cover, fig. 63. is to be ſcrewed on the top of the inſtrument, as by this its inſulation is preſerved, notwithſtanding the rain.

19
Or to certain kind o

This inſtrument indicates not only the electricity of fogs, but that alſo of ſerene weather, and enables us to diſcover the kind of electricity which reigns in the atmoſphere; and to a certain degree to form an eſtimate of its quantity, and that under two different points of view, the degree of intenſity, and the diſtance from the earth at which it firſt begins to be ſenſible.

A conductor exhibits ſigns of electricity only when the of the electric fluid is more or leſs condenſed in the air than in the earth. Though the air reſiſts the paſſage of the electric fluid, it is not abſolutely impermeable to it; it ſuffers it to paſs gradually, and generally with more eaſe in proportion as its maſs or thickneſs is leſs. It is therefore intereſting to diſcover at what height it is neceſſary to be elevated, in order to find a ſenſible difference between the electricity of the earth and that of the air. A very ſenſible difference may be generally diſcovered by this inſtrument at the diſtance of four or five feet from the ground; ſometimes it may be ſeen if the inſtrument is placed even on the ground, while at others it muſt be raiſed ſeven or more feet before the balls will open; ſometimes, though ſeldom, this height is not ſufficient. This diſtance is generally greateſt when the electricity is ſtrongeſt, though neceſſarily modified by a variety of circumſtances, ſome of which are known, as the degree of dryneſs or humidity of the air, and others are unkown.

The degree of intenſity, at a given height, may be diſcovered thus: raiſe the electrometer, and judge by the diviſions which are placed on the edge thereof the degree of their divergence. To find the relation between this degree of divergence and the force of the electricity, M. Sauſſure took the following method: As he could not with certainty double or triple a given quantity of electricity; yet as a given force may be reduced one half, a fourth, or eighth, &c. by dividing it between two equal and ſimilar bodies, the electricity contained in one; he took two of his unarmed electrometers, which were as ſimilar as poſſible, and electrified one of them, ſo that the balls ſeparated preciſely 6 lines: he then touched the top thereof by the top of that which was not electrified; in an inſtant the electricity was equally divided between them, as was evident by the divergence of the balls, which was 4 lines in each; conſequently, a diminution of half the denſity had only leſſened the divergence one third. One of theſe electrometers was then deprived of its electricity, and was afterwards brought in contact with the other, as before; the remaining electricity divided itſelf again between them, and the balls fell from 4 to 28 lines, nearly in the ſame proportion as before; in the third operation they fell to 19; in the fourth to one, where he was obliged to ſtop, as there was not now ſufficient force in the fluid to paſs from one electrometer to the other, and diſtribute itſelf uniformly between them. The ſame experiment repeated ſeveral times gave very nearly the ſame reſults. Negative electricity decreaſed alſo in the ſame proportion as the poſitive. The following table may therefore be conſidered as giving a general, though not exact, idea of the increaſe in force, which correſponds to different degrees of divergence in the balls; it is only calculated to every fourth of a line; the force of electricity is always expreſſed by whole numbers, as it would be ridiculous to put a greater degree of axactneſs in the numbers than is to be found in the experiments which form the baſis of the calculation (L).

Methods of meaſuring Electricity, &c.

| Diſtance of the balls in fourths of a line. | Correſponding forces of electricity. |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| 4 | 4 |
| 5 | 5 |
| 6 | 6 |
| 7 | 8 |
| 8 | 10 |
| 9 | 12 |
| 10 | 14 |
| 11 | 17 |
| 12 | 20 |
| 13 | 23 |
| 14 | 26 |
| 15 | 29 |
| 16 | 32 |
| 17 | 36 |
| 18 | 40 |
| 19 | 44 |
| 20 | 48 |
| 21 | 52 |
| 22 | 56 |
| 23 | 60 |
| 24 | 64 |

Thoſe who are deſirous to carry this meaſure of the electric force further, may do it by having ſimilar electrometers conſtructed, but made upon a larger ſcale, and with heavier balls, which would only ſeparate one line, with the degree of electricity that makes the ſmaller ones diverge 6 lines; theſe would conſequently meaſure a force 1024 times greater than that which forms the unity of the preceding table; and thus by degrees we may be enabled to diſcover the ratio of the ſtrongeſt diſcharge of a great battery, or perhaps even of thunder itſelf, to that of a piece of amber, which only attracts a bit of ſtraw or any other light ſubſtance. (M). In

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(L) M. Sauſſure, in a long note, anticipates the objections that may be made to the foregoing method of eſtimating the force of electricity; but as at the moſt they only ſhow that this ſcience is at preſent in a ſtate of conſiderable imperfection, it will be unneceſſary to take notice of them here.

(M) The conſideration of the repulſive force is not ſufficient to diſcover the abſolute force of an exploſion or electrical diſcharge: for M. Volta has ſhown, that the force of a diſcharge depends principally on the quantity of the electric fluid which paſſes from one body to another. Now the repulſive force of the electrometer only indicates the ratio of this quantity in equal and ſimilar bodies, and which are alſo ſimilarly ſituated. If equal quantities of the electric fluid were imparted to two unequal and ſeparate conductors, the electric fluid being leſs condenſed on the largeſt, would act with the leaſt force on the electrometer; though it is probable, the force of the diſcharge in the two conductors would be equal. The repulſive force ſerves, however, to ſhow what M. Volta calls the *electrical capacity* of a body, the quantity of the electric fluid it actually contains, or is capable of containing. To effect this, and have points of compariſon, we ſhould uſe light metallic balls, of different ſizes, ſuſpended by ſilk thread. One of theſe balls, unelectrified, being brought into contact with the ſubſtance

192 How to obſerve the electricity of the atmoſphere.

In order to obſerve the electricity of the atmoſphere with this inſtrument, we muſt firſt bring the electric fluid contained in the electrometer to the ſame degree of denſity with that at the ſurface of the earth; this is eaſily done by letting the bottom and top touch the ground at the ſame time; then raiſe the point, keeping the bottom ſtill in contact with the ground, from whence it may be lifted up in a vertical poſition till the balls are level with the eye.

193 How to render the ſigns of electricity in the electrometer permanent.

The ſecond circumſtance is to render the divergence of the balls, which is occaſioned by the electricity of the air, permanent. This is effected by touching the top of the electrometer with the finger: but here the acquired electricity becomes contrary to that of the body by which they are electrified. Let us ſuppoſe, for example, that the electrometer is at five feet from the ground, and the balls diverging; touch the top of the electrometer with the finger, and the balls will cloſe; but they will again open if the electrometer is withdrawn from the influence of the electricity of the air, by being brought nearer the ground, or into the houſe. M. Sauſſure only employed this method when the electricity was ſo weak that he could not perceive any until the electrometer was raiſed conſiderably above his eye: as in this caſe he could not perceive the divergence of the balls, he always endeavoured to obtain a permanent electricity in the foregoing manner.

194 How to diſtinguiſh the two electricities.

To know whether the balls ſeparate with poſitive or negative electricity, bring a piece of excited wax gradually near the top of the electrometer; if the balls ſeparate further on the approach of the wax, they are negatively electrified, or of the ſame nature with the electricity of the wax; if on the other hand they come nearer together on the approach of the wax, then the electricity is poſitive, or in a contrary ſtate to that of the wax. If glaſs is uſed, the reſults will be exactly the reverſe of the preceding.

The following example will render the uſe of the foregoing obſervations more familiar. Chooſe an open ſituation free from trees and houſes, ſcrew the conductor on the top of the electrometer, lay hold of it by its baſe, and place it ſo that the baſe and conductor may touch the ground at the ſame time; then elevate it to the height of the eye, and obſerve the quantity of lines, or fourths of a line, that the balls have diverged; now lower it till the balls almoſt touch each other, and obſerve at what diſtance the top of the conductor is from the ground; and this is the height from the ground at which the electricity of the air begins to be ſenſible. If the electricity of the air is ſufficiently ſtrong to make the balls diverge when it ſtands upon the ground, one of the lengths of the electrometer muſt be unſcrewed from it. If the balls however ſtill diverge, the other parts of the conductor ſhould alſo be unſcrewed, and you may mark down, that the electricity is ſenſible at zero, or on the ſurface of the earth. If, on the contrary, the electricity is ſo weak, as not to cauſe the balls to diverge when they are even with the eye, and conſequently when the conductor is two feet higher, or ſeven feet from the ground, you ſhould then raiſe it a foot higher; while it is thus elevated, touch the top with the other hand; when this hand is taken away, lower the electrometer, and if it is electrified you may ſay the electricity is ſenſible at eight feet; if it is not, raiſe it as high as the arm can reach, and repeat the ſame operation; if any electricity is found, write down electricity ſenſible at nine feet; if not, mark 0, or no electricity relative to this inſtrument, and this mode of employing it; for ſigns of electricity may ſtill be obtained, by throwing a metallic ball 50 or 60 feet into the air, which is at the ſame time connected with the electrometer by a metallic thread.

One advantage of this inſtrument is, that it will often exhibit ſigns of electricity when none can be obtained from a conductor of 100 feet in height, becauſe it can more eaſily be preſerved from humidity, &c. which deſtroy the inſulation of the large conductors.

19 Obſer- cal el city.

Aerial electricity varies according to the ſituation; it is generally ſtrongeſt in elevated and inſulated ſituations, not to be obſerved under trees, in ſtreets, in houſes, or any incloſed places; though it is ſometimes to be found pretty ſtrong on quays and bridges. It is alſo not ſo much the abſolute height of the places as their ſituation; thus a projecting angle of a high hill will often exhibit a ſtronger electricity than the plain at the top of the hill, as there are fewer points in the former to deprive the air of its electricity.

The intenſity of the atmoſpheric electricity is varied by a great many circumſtances, ſome of which may be eaſily accounted for, others with more difficulty. When the weather is not ſerene, it is impoſſible to aſſign any rule for their variation, as no regular correſpondence can then be perceived with the different hours of the day, nor with the various modifications of the air. The reaſon is evident; when contrary and variable winds reign at different heights, when clouds are rolling over clouds, theſe winds and clouds, which we cannot perceive by any exterior ſign, influence however the ſtrata of air in which we make our experiments, produce theſe changes of which we only ſee the reſult, without being able to aſſign either the cauſe or its rela-

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ſubſtance whoſe electricity is to be explored, will diminiſh the tenſion or repulſive force of this ſubſtance; and the quantity diminiſhed by the contact of the ball will give the ratio of the capacity of this ſubſtance with that of the ball. Let us ſuppoſe a Leyden phial uninſulated, but ſo concealed, that only the knob is viſible, and we are therefore ignorant of its ſize, and the ſtrength of the ſhock it will give. Let the top of M. Sauſſure's electrometer be in contact with the knob of the bottle, and the balls of the electrometer ſeparate 6 lines,—from this ſolitary fact, we ſhall gain no information relative to the force of the ſhock; becauſe, if the jar is very large, this degree of tenſion will give a very painful ſenſation; when, if it is very ſmall, with the ſame indicated tenſion, the ſenſation may be almoſt imperceptible. But if we bring a ball of a foot diameter, in contact with the knob of the bottle, and after having thus taken a part of the fluid therefrom, the electrometer is again put in contact with the knob thereof, the remaining quantity of repulſive force will ſhow the relation between its contents and that of the globe of metal, and by this means the intenſity of its charge.

ds of ring icity, relation. Thus, in ſtormy weather, we ſee the electricity ſtrong, then null, and in a moment after ariſe to its former force; one inſtant poſitive, the next negative, without being able to aſſign any reaſon for theſe changes. M. Sauſſure ſays, that he has ſeen theſe changes ſucceed with ſuch rapidity, that he had not time to note them down.

When rain falls without a ſtorm, theſe changes are not ſo ſudden; they are, however, very irregular, particularly with reſpect to the intenſity of force; the quality thereof is more conſtant. Rain or ſnow almoſt uniformly gives poſitive electricity.

In cloudy weather, without rain or ſtorms, the electricity follows generally the ſame laws as in ſerene weather.

Strong winds generally diminiſh its intenſity; they mix together the different ſtrata of the atmoſphere, and make them paſs ſucceſſively towards the ground, and thus diſtribute the electricity uniformly between the earth and the air. M. Sauſſure has obſerved a ſtrong electricity with a ſtrong north wind.

The ſtate of the air in which the electricity is ſtrongeſt, is foggy weather: this is always accompanied with electricity, except when the fog is going to reſolve into rain.

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The moſt intereſting obſervations, and thoſe which throw the greateſt light upon the various modifications of electricity in our atmoſphere, are thoſe that are made in ſerene weather. In winter (during which moſt of M. Sauſſure's obſervations were made), and in ſerene weather, the electricity was generally weakeſt in an evening, when the dew had fallen, until the moment of the ſun's riſing: its intenſity afterwards augmented by degrees, ſometimes ſooner and ſometimes later; but generally before noon, it attained a certain maximum, from whence it again declined, till the fall of the dew, when it would be ſometimes ſtronger than it had been during the whole day; after which, it would again gradually diminiſh during the whole night; but it is never quite deſtroyed, if the weather is perfectly ſerene.

Atmoſpherical electricity ſeems, therefore, like the ſea, to be ſubject to a flux and reflux, which cauſes it to increaſe and diminiſh twice in 24 hours. The moments of its greateſt force are ſome hours after the riſing and ſetting of the ſun; thoſe when it is weakeſt, precede the riſing and ſetting thereof.

7 uſ- ob- ions s ſub- an rdi- le- of

M. Sauſſure has given an inſtance of this periodic flux in electricity: On the 22d of February 1785, (one of the coldeſt days ever remembered at Geneva), the hygrometer and thermometer were ſuſpended in the open air on a terrace expoſed to the ſouth-weſt; the electrometer, from its ſituation, indicated an electricity equal to what it would have ſhown if it had been placed on an open plain. The height of the barometer was reduced to what it would have been if the mercury had been conſtantly at the temperature of 10 degrees of Reamur's thermometer. The place of obſervation was elevated 60 feet above the level of the lake. The obſervations of the day preceding and following this great cold were marked down by him; becauſe it is pleaſing to have theſe which precede and follow any ſingular phenomena. There was a weak S. W. wind during the whole three days; and it is rather remarkable, that moſt of the great colds, which have been obſerved at Geneva, were preceded by, or at leaſt accompanied with, a little S. W. breeze.

Methods of meaſuring electricity, &c

198 Of the maximum and minimum of the electricity of the atmoſphere on this occaſion.

From the firſt 18 obſervations made during theſe three days, when the ſky was quite ſerene, we learn that the electricity was pretty ſtrong at nine in the morning; that from thence it gradually diminiſhed till towards ſix in the evening, which was its firſt minimum; after which it increaſed again till eight, its ſecond maximum; from whence it again gradually declined till ſix the next morning, which was the time of its ſecond minimum; after which, it again increaſed till ten in the morning, which was the firſt maximum of the following day; as this was cloudy, the electric periods were not ſo regular.

199 Electricity weaker in ſummer than in winter.

The electricity of ſerene weather is much weaker in ſummer than in winter, which renders it more difficult to obſerve theſe gradations in ſummer than in winter; beſides a variety of accidental cauſes, which at the ſame time render them more uncertain. In general, in ſummer, if the ground has been dry for ſome days, and the air is dry alſo, the electricity increaſes from the riſing of the ſun till three or four in the afternoon, when it is ſtrongeſt; it then diminiſhes till the dew begins to fall, which again reanimates it; tho' after this it declines, and is almoſt extinguiſhed during the night.

But the ſerene days that ſucceed rainy weather in ſummer, generally exhibit the ſame diurnal periods or ſtates of electricity, as are to be obſerved in winter.

200 Air always poſitively electrified.

The air is invariably poſitive in ſerene weather, both in winter and ſummer, day and night, in the ſun or in the dew. It would ſeem, therefore, that the electricity of the air is eſſentially poſitive; and that whenever it appears to be negative, in certain rains or in ſtorms, it probably ariſes from ſome clouds, which have been expoſed to the preſſure of the electric fluid contained in the upper part of the atmoſphere, or to more elevated clouds that have diſcharged a part of their fluid upon the earth, or upon other clouds.

In order to find out the cauſe of theſe phænomena, M. Sauſſure inſtituted a ſet of experiments on evaporation, avoiding the uſe of M. Volta's condenſer.

201 Sauſſure's experiments to determine the cauſe of the phenomena of atmoſpherical electricity

To produce a ſtrong evaporation, he threw a maſs of red-hot iron into a ſmall quantity of water, which was contained in a coffee-pot with a large mouth, and ſuſpended by ſilk ſtrings; by this he obtained a ſtrong poſitive electricity; though, according to M. Volta's ſyſtem, it ought to have been negative: the experiment was repeated ſeveral times, varying ſome of the circumſtances, but the reſult was always the ſame.

As it was not eaſy to think ſo able a philoſopher as M. Volta was deceived, it was neceſſary to try the experiment in a manner more analogous to that of M. Volta. A ſmall chafing-diſh was therefore inſulated by ſilk cords, and the coffee-pot, with a ſmall quantity of water, placed on it; one electrometer was connected with the coffee-pot and another with the chafing-diſh; the fire was raiſed by a pair of bellows; when the water had boiled ſtrongly for a few minutes, both electrometers exhibited ſigns of electricity, which, on examination, was found to be negative; proving the truth of M. Volta's experiment.

The evaporation produced by the effervefcence of iron in the vitriolic acid, and by that of chalk in the ſame acid, gave alſo negative electricity.

It was now neceſſary to inquire, why the vapour, excited by the heated iron, produced poſitive electricity; while that from boiling water in any other way produced a negative electricity?

202
Immenſe quantity of electricity extricated from volcanoes, &c.

M. Sauſſure ſuſpected, that the intenſity of heat to which the water is expoſed, by the contact of a body in a ſtate of incandeſcence, was the cauſe of the electricity produced by its evaporation; and that a combination was then formed, by which a new quantity of the electric fluid was produced. This conjecture may at firſt ſight ſeem improbable; but the quantity of electricity produced by this experiment will aſtoniſh thoſe that repeat it: and this quantity is the more ſurpriſing, becauſe, if it is true, according to the ſyſtem of M. Volta, that the waters abſorb, while they are forming a quantity of the electric fluid, there muſt, therefore, be enough developed in this experiment for the formation of the great quantity of vapours produced by the heated iron, and afterwards a ſufficient quantity to electriſy ſtrongly the apparatus, and all theſe vapours.

This experiment ſhows clearly the cauſe of that prodigious quantity of electricity which is unfolded in the eruption of volcanos; as it is probable that the water in theſe, from many circumſtances, acquires a much greater degree of heat than is given to it in our experiments.

203
Poſitive electricity always produced by the combuſtion of iron.

To verify this conjecture, that it was in ſome meaſure the combuſtion of the water or the iron that produced the poſitive electricity, it was proper to try whether, by a regular moderation of the heat of the iron, poſitive electricity would always be obtained. This was eſſayed in the following manner: A large iron crucible, five inches high, four in diameter, and ſix lines thick, was heated red hot, then inſulated; after which, ſmall quantities of water were thrown into it, each projection of the water cooling more and more the crucible; thus deſcending by degrees till there was only ſufficient heat to boil the water; carefully obſerving, and then deſtroying, the electricity produced at each projection. The electricity was always poſitive or null; at the firſt projections it was very ſtrong; it gradually diminiſhed to the twelfth, when it was ſcarce ſenſible, though always with a tendency to be poſitive.

On repeating this experiment, and varying it in different ways, a remarkable circumſtance was obſerved: When a ſmall quantity of water was thrown into the crucible, the moment it was taken from the fire, while it was of a pale red, approaching what is called the *white heat*, no electricity was obtained.

204
Water evaporates more ſlowly on a red hot metal than on one heated to a leſſer degree.

This fact ſeemed to have ſome connection with another mentioned by Muſſchenbroek, that water evaporates more ſlowly on a metal, or any other incandeſcent body, than on the ſame body, heated only a ſmall degree above boiling water. To examine this relation, and to find whether there was any between the periods of evaporation and the production of electricity, M. Sauſſure made a great number of experiments, which are moſt accurately deſcribed in his work; but as the detail would be much too long, we ſhall only preſent the reader with the heads thereof, and a deſcription of the apparatus.

205
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ments.

The apparatus conſiſted of a pot of clay, well baked or annealed, 15 lines thick and 4 inches diameter; this was inſulated by a dry glaſs goblet; upon this pot was placed the crucible, or any other heated ſubſtance on which the water was to be thrown, in order to be reduced into vapour; the crucible was contiguous to a wire connected with an electrometer; a meaſure, containing 54 grains weight of diſtilled water, was thrown upon the heated crucible: the time employed in the evaporation thereof was obſerved by a ſecond watch; the electricity produced by this evaporation was noted. When this meaſure of water was reduced into vapour, the electricity of the apparatus is deſtroyed, and a freſh meaſure of water is thrown into the crucible, proceeding in the ſame manner till the crucible is almoſt cold.

206
Experiments
this ap
ratus.

The firſt experiment was with an iron crucible, from which it was found that Muſſchenbroek was not right in ſaying that the evaporation was ſloweſt when the iron was hotteſt; for at the inſtant it was taken from the fire, it required 19 ſeconds to evaporate the water, and took more time till the third projection, when it took 35 ſeconds, though from that period it employed leſs time, or in other words, the evaporation accelerated in proportion as the iron cooled.

With reſpect to the electricity, it was at firſt 0, then poſitive, afterwards negative, then 0, and afterwards poſitive to the end of the experiment. The vapour was not viſible till the 7th projection.

In the ſecond experiment with the ſame crucible, though every endeavour was made uſe of to render them as ſimilar as poſſible, the electricity was conſtantly poſitive.

The third experiment was with a copper crucible: here alſo the electricity was poſitive; and the longeſt time employed in evaporation was not the inſtant of the greateſt heat. It was very curious to ſee the water endeavouring to gather itſelf into a globule, like mercury on glaſs, to be ſometimes immoveable, and then to turn on itſelf horizontally, with great rapidity; ſometimes throwing from ſome of its points a little jet, accompanied with an hiſſing noiſe.

The fourth experiment was with the ſame crucible: the electricity was at firſt negative, then conſtantly poſitive.

The fifth was with a crucible of pure ſilver: a conſiderable time was employed here in evaporating the ſame quantity of water; even in the inſtant of the greateſt heat it took 5 minutes 6 ſeconds; the electricity was weak; three times no electricity was perceived; five times negative electricity was diſcovered.

In a ſixth experiment with the ſame crucible, a poſitive electricity was obtained at the ſecond projection, after which none of any kind was perceived.

The ſeventh with the ſame, gave at firſt a ſtrong negative electricity; the ſecond and third projection gave a weak poſitive electricity.

The eighth was made with a porcelain cup: here the evaporation was ſlower at the ſecond than the firſt projection; but from this it took longer time till it was nds of ring icity,

cold, contrary to what happened with the metals; the electricity was always negative.

The ninth and tenth experiments with the ſame cup produced ſimilar effects.

The eleventh experiment was with ſpirits of wine in a ſilver crucible: there was no electricity produced at the two firſt projections, and what was afterwards obtained was negative.

Twelfth experiment with ether: here the electricity was alſo negative. Theſe two inflammable fluids, in evaporating, followed the ſame laws as water, being diſſipated at firſt moſt rapidly in the greateſt heat, afterwards taking a longer and longer time before they were evaporated to a certain period, then employing leſs time, or evaporating quicker, till the crucible was nearly cold.

Now as china and ſilver always produced negative electricity, while iron and copper have generally given poſitive electricity, we may conclude, that electricity is poſitive with thoſe bodies that are capable of decompoſing water, or of being decompoſed themſelves by their contact with the water; and negative with thoſe which are not at all decompoſed or altered.

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From hence M. Sauſſure conjectures, that the electric fluid may be looked upon as formed by the union of fire with ſome unknown principle, perhaps a fluid analogous to inflammable air, but exceedingly more ſubtle. This analogy ſeems to him ſufficiently proved by the inflammation of the electric fluid, and by the diminution of the air in which this inflammation is made. Though many doubts have been attempted to be thrown on this inflammation, there ſeems to be one reaſon which forces us to admit it, which is the loſs of a quantity of this fluid at every ſpark; we may diminiſh at pleaſure any quantity of this fluid by taking a number of ſparks from it. From whence alſo it may be inferred, that a conſiderable quantity is deſtroyed every day by thunder.

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According to this ſyſtem, when the operation, which converts water into vapour, produces at the ſame time a decompoſition, it then generates the electric fluid. A part of this fluid combines itſelf immediately with theſe vapours, and ſerves even to form them. The veſſel in which this operation is performed, will acquire a poſitive electricity, none at all, or a negative, according as the quantity of the fluid generated is ſuperior, equal, or inferior to that which the formation of the vapour conſumes. When no decompoſition accompanies the evaporation, the electricity ought to be conſtantly negative, becauſe there is nothing to replace the quantity of this fluid which is employed in forming the vapour.

If in the foregoing experiments, thoſe ſubſtances which were ſuſceptible of calcination had conſtantly given a poſitive electricity, and thoſe which do not calcine had always given the negative, every thing would have been explained by theſe principles, and they would thence have acquired a greater degree of probability: but the phenomena have not always followed this law. We have ſeen iron and copper ſometimes give a negative electricity, and ſilver the poſitive. The firſt caſe is not difficult to account for; it is well known with what facility iron and copper calcine in a briſk fire; they become covered with a ſcaly cruſt, which is not ſuſceptible of any further alteration with the ſame heat. If the bottom of the crucible acquires this cruſty coating, the drop of water placed thereon will be no longer in contact with a calcinable ſubſtance; there will be no farther decompoſition, no generation of the electric fluid: the vapours, however, which are ſtill formed, will abſorb a part of the fluid naturally contained in the apparatus, and this will therefore be electrified negatively. If ſome of the ſcales ſhould be ſo far detached, that the water may gain ſome points of contact, the quantity thus generated may compenſate for what is abſorbed by the vapours, and thus the electricity will be null. If more are detached, it will ſuperabound and be poſitive. For the ſame reaſons, a large maſs of water, by attacking the iron in a greater number of points, always gives poſitive electricity; and hence, alſo, a ſtrong poſitive electricity is obtained, by throwing a piece of red-hot iron into a maſs of water.

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It is not ſo eaſy to explain why ſilver gives ſometimes a poſitive electricity, but by ſuppoſing it to have been mixed with ſome ſubſtances capable of calcination; and this the more, as the white porcelain always gave negative electricity. This ſuppoſition was verified by ſome ſubſequent experiments, in which the ſame ſilver, when purified, always gave a negative electricity.

M. Sauſſure owns himſelf incapable of explaining why heated charcoal always gives negative electricity; unleſs it can be attributed to the promptitude with which ſo rare a ſubſtance loſes its heat by the contact of water.

210
No ſigns of electricity to be obtained from combuſtion.

One fact aſtoniſhed him, namely, that by combuſtion properly ſo called, although it is an evaporation, nay, the higheſt degree of evaporation, he never obtained any ſigns of electricity, though he tried to obtain it in a variety of ways. Probably the current produced by the flame diſperſes and diſſipates the electricity as ſoon as it is formed. The caſe, however, muſt not be looked upon as general, becauſe M. Volta obtained ſigns of electricity from bodies in combuſtion by means of his condenſer.

Another ſingular fact was, his not being able to obtain electricity without ebullition, though he endeavoured to compenſate by the quantity of ſurface for the quantity of vapours that were elevated by boiling water; and indeed, the ſame quantity of water, if extended over too large a ſurface, will not give any electricity.

211
Mr Bennet's electrometer deſcribed.

But of all the inſtruments by which it hath been attempted to meaſure electricity, none have been found to anſwer the purpoſe equally well with that invented by Mr Bennet, of which an account is given in the 77th volume of the Philoſophical Tranſactions, and which is repreſented fig. 64. It conſiſts of two ſlips of leaf gold, *a a*, ſuſpended in a glaſs cylinder *b*. The foot *c* may be made of wood or metal, and the cap *d* of metal; the latter being made flat at top for the convenience of putting any thing upon it that is to be electrified. The cap is about an inch wider than the diameter of the glaſs, and its rim about three quarters of an inch broad, hanging parallel to the glaſs to keep it ſufficiently inſulated, and to turn off the rain. Within this is another circular rim about half as broad as the former, lined with ſilk or velvet, ſo that

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it may be made to fit the outſide of the glaſs exactly, while the cap may be eaſily taken off to repair any accident happening to the gold-leaf. From the centre of the cap hangs a tin tube ſomewhat longer than the depth of the inner rim, in which a ſmall peg *f* is placed, which may be taken out occaſionally. To this peg, which is rounded at one end and flat at the other, two ſlips of leaf-gold are faſtened with paſte, gum-water, or varniſh. Theſe are about a fifth-part of an inch broad, and two inches long, tapering to a ſharp point. In one ſide of the cap is a ſmall tube *g*, to place wires in: *h h* are two long pieces of tin-foil faſtened with varniſh on oppoſite ſides of the internal ſurface of the glaſs, where the leaf-gold may be expected to ſtrike, and in connection with the foot. The upper end of the glaſs is covered and lined with ſealing-wax as low as the outermoſt rim, to make the inſulation more perfect. An improvement on this electrometer is to make the cylinder pretty long, and to have a ſmall additional tube of gum-lac on the end of it. The ſlips of tin-foil reach almoſt to the edge of the outer rim, and are ſharp pointed at top; widening in the middle, and decreaſing in breadth again as they deſcend.

212 Its extreme ſenſibility.

The ſenſibility of this electrometer is extreme, as appears from the following examples.

1. On putting powdered chalk into a pair of bellows, and blowing it upon the cap, the latter was electrified poſitively when the nozzle of the bellows was about ſix inches from it; but at the diſtance of three feet from the nozzle, the ſame ſtream electrified it negatively. Thus it appears that the electricity may be changed from poſitive to negative from the mere circumſtance of the wider diffuſion of this ſtream of chalk in the air. It may alſo be changed by placing a bunch of fine wire, ſilk, or feathers, in the nozzle of the bellows; and it is likewiſe negative when blown from a pair of bellows without their iron-pipe, ſo that it may come out in a larger ſtream: but this laſt experiment was found to anſwer beſt in wet weather. There is likewiſe a remarkable difference between the experiment in which the electricity is poſitive and that in which it is negative; the former being communicated with ſome degree of permanency to the cap, ſo that the gold-leaf continues for ſome time to diverge; but the latter being only momentary, and the gold-leaf collapſing as ſoon as the cloud of chalk is diſperſed. The reaſon why the former continues is, that the chalk ſticks to the cap.

2. A piece of chalk drawn over a bruſh, or powdered chalk put into the bruſh, and projected upon the cap, electrifies it negatively; but its electricity is not communicated.

3. Powdered chalk blown with the mouth or bellows from a metal plate placed upon the cap, electrifies it permanently poſitive. Or if the chalk is blown from the plate, either inſulated or not, ſo that the powder may paſs over the cap, if not too far off, it is alſo poſitive. Or if a bruſh is placed upon the cap, and a piece of chalk drawn over it, when the hand is withdrawn, the leaf gold gradually opens with poſitive electricity as the cloud of chalk diſperſes.

4. Powdered chalk falling from one plate to another placed upon the inſtrument, electrifies it negatively.

Meth meaſu Electr &c.

Other methods of producing electricity with chalk and other powders have been tried; as projecting chalk from a gooſe wing, chalking the edges of books and clapping the book ſuddenly together, alſo ſifting the powder upon the cap; all which electrified it negatively: but the inſtrument being placed in a duſty road, and the duſt ſtruck up with a ſtick near it, electrified it poſitively. Breaking the *glaſs-tear* upon a book electrified it negatively, but when broken in water it did not electrify it.

Wheat-flour and red-lead are ſtrongly negative in all caſes where the chalk is poſitive. The following powders were like chalk: red ochre and yellow roſin, coal aſhes, powdered crocus metallorum, aurum moſaicum, black-lead, lampblack (which was only ſenſible in the two firſt methods), powdered quick-lime, umber, lapis calaminaris, Spaniſh brown, powdered ſulphur, flowers of ſulphur, iron-filings, ruſt of iron, ſand. Roſin and chalk, ſeparately alike, were changed by mixture; this was often tried in dry weather, but did not ſucceed in damp: white lead alſo ſometimes produced poſitive and ſometimes negative electricity when blown from a plate.

If a metal cup be placed upon the cap with a red-hot coal in it, a ſpoonful of water thrown in electrifies the cap negatively; and if a bent wire be placed in the cap, with a piece of paper faſtened to it to increaſe its ſurface, the poſitive electricity of the aſcending vapour may be tried by introducing the paper into it. Perhaps the electrification of fogs and rain is well illuſtrated by pouring water through an inſulated cullender, containing hot coals, where the aſcending vapour is poſitive and falling drops negative.

21 Confic ably a mente means lighte candle

The ſenſibility of this electrometer may be conſiderably increaſed by placing a candle upon the cap. By this means, a cloud of chalk, which in the other caſe only juſt opens the leaf-gold, will cauſe it to ſtrike the ſides for a long time together; and the electricity, which was not before communicated, now paſſes into the electrometer, cauſing the leaf-gold to repel after it is carried away. Even ſealing-wax by this means communicates its electricity at the diſtance of 12 inches at leaſt, which it would ſcarcely otherwiſe do by rubbing upon the cap.

A cloud of chalk or wheat flower may be made in one room, and the electrometer with its candle be afterwards leiſurely brought from another room, and the cloud will electrify it before it comes very near. The air of a room adjoining to that wherein the electrical machine was uſed, was very ſenſibly electrified, which was perceived by carrying the inſtrument through it with its candle.

21 Its ap tion t lectric kites.

In very clear weather, when no clouds were viſible, the electrometer has been often applied to the inſulated ſtring of kites without metal, and their poſitive electricity cauſed the leaf-gold to ſtrike the ſides; but when a kite was raiſed in cloudy weather with a wire in the ſtring, and when it gave ſparks about a quarter of an inch long, the electricity was ſenſible by the electrometer at the diſtance of ten yards or more from the ſtring; but when placed at the diſtance of ſix feet, the leaf-gold continued to ſtrike the ſides of the electrometer for more than an hour together, with a velocity increaſing and decreaſing with the denſity or diſtance of the unequal clouds which paſſed over.

Sometimes the electricity of an approaching cloud has

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has been ſenſible without a kite, though in a very unfavourable ſituation for it, being in a town ſurrounded with hills, and where buildings encompaſſed the wall on which the electrometer was placed. A thunder-cloud paſſing over, cauſed the leaf-gold to ſtrike the ſides of the glaſs very quick at each flaſh of lightning.

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No ſenſible electricity is produced by blowing pure air, projecting water, by ſmoke, flame, or exploſions of gunpowder.

A book was placed upon the cap, and ſtruck with ſilk, linen, woollen, cotton, parchment, and paper, all which produced negative repulſion; but when the other ſide of the book was ſtruck with ſilk, it became poſitive; this ſide, ſtruck at right angles with the former, was again negative; and by continuing the ſtrokes which produced poſitive, it changed to negative for a little while; and, by ſtopping again, became poſitive. No other book would do the ſame, though the ſides were ſcraped unchalked, upon a ſuppoſition that altering the ſurface would produce it. At laſt, one ſide of a book was moiſtened, which changed it; whence it was concluded, that one edge of the book had lain in a damp place; which conjecture was farther confirmed by all the books becoming poſitive in damp weather, and one of them being dried at the fire again became negative.

When the cap is approached with excited ſealing-wax, the leaf-gold may be made to ſtrike the ſides of the glaſs more than twelve times; and as the ſealing-wax recedes, it ſtrikes nearly as often; but if it approaches much quicker than it recedes, the ſecond nnmber will ſometimes be greater.

The quantity of electricity neceſſary to cauſe a repulſion of the leaf-gold is ſo ſmall, that the ſharpeſt point or edges do not draw it off without touching; hence it is unneceſſary to avoid points or edges in the conſtruction of this inſtrument.

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To the experiments on blowing powders from a pair of bellows it may be added, that if the powder is blown at about the diſtance of three inches upon a plate which is moiſtened or oiled, its electricity is contrary to that produced by blowing upon a dry plate. This ſhows that the electricity of the ſtreams of powder iſſuing out of the bellows is only contrary to the more expanded part, becauſe it is within the influence of its atmoſphere; for when this is deſtroyed by the adheſion of the powder to the moiſtened plate, it is negative when the bellows are poſitive, as it was before poſitive when the more expanded cloud was negative. The experiments on evaporation of water may be tried with more eaſe and certainty of ſucceſs by heating the ſmall end of a tobacco-pipe, and pouring water into the head; which running down to the heated part, is ſuddenly expanded, and will ſhow its electricity when projected upon the cap of the electrometer more ſenſibly than any other way that has been tried. If the pipe be fixed in a cloven ſtick, and placed in the cap of one electrometer whilſt the ſteam is projected upon another, it produces both electricities at once. Spirit of wine and ether are electrified like water. Oil and vitriolic acid produced ſmoke without any change of electricity. In theſe experiments a long pipe is better than a ſhort one.

Methods of meaſuring electricity, &c.

Beſides theſe inſtruments, there are ſeveral others invented by Mr Cavallo which anſwer the purpoſe of obſerving the electricity of the atmoſphere extremely well, tho' not with ſuch great accuracy as that juſt now deſcribed; and of which he gives the following account.

217
Mr Cavallo's inſtrument for obſerving the electricity of the atmoſphere.

"Fig. 67. repreſents a very ſimple inſtrument for making experiments on the electricity of the atmoſphere; and which, on ſeveral accounts, ſeems to be the moſt proper for that purpoſe. *AB* is a common jointed fiſhing-rod, without the laſt or ſmalleſt joint. From the extremity of this rod proceeds a ſlender glaſs tube *C*, covered with ſealing-wax, and having a cork *D* at its end, from which a pith ball electrometer is ſuſpended. *HGI* is a piece of twine faſtened to the other extremity of the rod, and ſupported at *G* by a ſmall ſtring *FG*. At the end (*I*) of the twine a pin is faſtened; which when puſhed into the cork *D*, renders the electrometer *E* uninſulated. When I would obſerve the electricity of the atmoſphere with this inſtrument, I thruſt the pin (*I*) into the cork *D*; and holding the rod by its lower end *A*, project it out from a window in the upper part of the houſe, into the air, raiſing the end of the rod with the electrometer, ſo as to make an angle of about 50° or 60° with the horizon. In this ſituation I keep the inſtrument for a few ſeconds; and then pulling the twine at *H*, the pin is diſengaged from the cork *D*: which operation cauſes the ſtring to drop in the dotted ſituation *KL*, and leaves the electrometer inſulated, and electrified with an electricity contrary to that of the atmoſphere. This done, I draw the electrometer into the room; and examine the quality of the electricity without obſtruction either from wind or darkneſs. With this inſtrument I have made obſervations on the electricity of the atmoſphere ſeveral times in a day for ſeveral months."

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His electrometer for rain.

His electrometer for rain is ſhown Plate CLXXVII. fig. 70. and of this he gives the following deſcription. "*ABCI* is a ſtrong glaſs tube about two feet and a half long, having a tin funnel *DE* cemented to its extremity, which funnel defends part of the tube from the rain. The outſide ſurface of the tube from *A* to *B* is covered with ſealing-wax; ſo alſo is the part of it which is covered by the funnel. *FD* is a piece of cane, round which braſs wires are twiſted in different directions, ſo as to catch the rain eaſily, and at the ſame time to make no reſiſtance to the wind. This piece of cane is fixed into the tube; and a ſlender wire proceeding from it goes through the bore of the tube, and communicates with the ſtrong wire *AG*, which is thruſt into a piece of cork faſtened to the end *A* of the tube. The end *G* of the wire *AG* is formed in a ring, from which I ſuſpend a more or leſs ſenſible pith-ball electrometer as occaſion requires. This inſtrument is faſtened to the ſide of the window-frame, where it is ſupported by ſtrong braſs hooks at *CB*; which part of the tube is covered with a ſilk lace, in order to adapt it better to the hooks. The part *FC* is out of the window, with the end *F* elevated a little above the horizon. The remaining part of the inſtrument comes through a hole in one of the lights of the ſaſh within the room, and no more of it touches the ſide of the window than the part *CB*. When it rains, eſpecially in paſſing ſhowers, this inſtrument, ſtanding in the ſituation above deſcribed, is frequently electrified; and, by the diverging of the electrometer, the quantity and quality of the electricity of the rain may be obſerved without any danger of a miſtake. With this inſtrument I have obſerved,

ſerved, that the rain is generally, though not always, electrified negatively; and ſometimes ſo ſtrongly, that I have been able to charge a ſmall coated phial at the wire *A G*. This inſtrument ſhould be fixed in ſuch a manner that it may be eaſily taken off from the window and replaced again as occaſion requires; for it will be neceſſary to clean it very often, particularly when a ſhower of rain is approaching."

210
All theſe inſtruments imperfect.

Notwithſtanding the great accuracy of theſe inſtruments, however, there are ſtill many degrees of electricity too ſmall to be obſerved by any of them. To be able to collect theſe, it is neceſſary to have one capable of retaining the electricity it receives for a conſiderable time, and of allowing it to accumulate till it becomes capable of being meaſured by ſome of the common methods. Upon inſtruments of this kind Mr Cavallo gives the following diſſertation.

220
Mr Cavallo's diſſertation on meaſuring ſmall degrees of electricity.

" Beſides the way of aſcertaining ſmall quantities of electricity by means of very delicate electrometers, two methods have been communicated to the philoſophical world, by which ſuch quantities of electricity may be rendered manifeſt as could not be perceived by other means. The firſt of thoſe methods is an invention of M. Volta, the apparatus for it being called the *condenſer of electricity*, and is deſcribed in the Philoſophical Tranſactions, Vol. LXXII. The ſecond is a contrivance of the above-mentioned Mr Bennet, who calls the apparatus *the doubler of electricity*. A deſcription of it is inſerted in the Philoſophical Tranſactions, Vol. LXXVII.

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Volta's condenſer.

" M. Volta's condenſer conſiſts of a flat and ſmooth metal plate, furniſhed with an inſulating handle, and a ſemiconducting, or imperfectly inſulating, plane. When one wiſhes to examine a weak electricity with this apparatus, as that of the air in calm and hot weather, which is not generally ſenſible to an electrometer, he muſt place the above-mentioned plate upon the ſemiconducting plane, and a wire, or ſome other conducting ſubſtance, muſt be connected with the metal plate, and muſt be extended in the open air, ſo as to abſorb its electricity; then, after a certain time, the metal plate muſt be ſeparated from the ſemiconducting plane; and being preſented to an electrometer, will electrify it much more than if it had not been placed upon the above mentioned plane.

" The principle on which the action of this apparatus depends is, that the metal plate, whilſt ſtanding contiguous to the ſemiconducting plane, will both abſorb and retain a much greater quantity of electricity than it can either abſorb or retain when ſeparate, its capacity being increaſed in the former and diminiſhed in the latter caſe.

" Whoever conſiders this apparatus, will eaſily find, that its office is not to manifeſt a ſmall quantity of electricity, but to condenſe an expanded quantity of electricity into a ſmall ſpace: hence, if by means of this apparatus one expected to render more manifeſt than it generally is, when communicated immediately to an electrometer, the electricity of a ſmall tourmalin, or of a hair when rubbed, he would find himſelf miſtaken.

222
Mr Bennet's doubler objected to.

" It is Mr Bennet's doubler that was intended to anſwer that end; viz. to multiply, by repeated doubling, a ſmall, and otherwiſe unperceivable, quantity of electricity, till it became ſufficient to affect an electrometer, to give ſparks, &c. The merit of this invention is certainly conſiderable; but the uſe of it is far from preciſe and certain.

" This apparatus conſiſts of three braſs plates, which we ſhall call *A*, *B*, and *C*; each of which is about three or four inches in diameter. The firſt plate *A* is placed upon the gold-leaf electrometer, or it may be ſupported horizontally by any other inſulating ſtand, and its upper part only is thinly varniſhed. The ſecond plate *B* is varniſhed on both ſides, and is furniſhed with an inſulating handle, which is faſtened laterally to the edge of it. The third plate *C* is varniſhed on the under ſide only, and is furniſhed with an inſulating handle, which is perpendicular to its upper ſurface.

" This apparatus is uſed in the following manner. The plate *B* being laid upon the plate *A*, the ſmall quantity of electricity, which is required to be multiplied, is communicated to the under part of the plate *A*, and at the ſame time the upper part of *B* is touched with a finger; then the finger is firſt removed; the plate *B* is afterwards removed from over the plate *A*. The plate *C* is now laid upon *B*, and its upper ſurface is touched, for a ſhort time, with a finger. By this operation it is clear, that if the electricity communicated to the plate *A* is poſitive, the plate *B* muſt have acquired a negative electricity, and the plate *C* muſt have acquired the poſitive, viz. the ſame of the plate *A*. Now the plate *B*, being ſeparated from *C*, is laid as before upon *A*; the edge of *C* is brought into contact with the under part of the plate *A*, and at the ſame time the upper part of *B* is touched with a finger; by which means the plate *B*, being acted upon by the atmoſpheres of both the plates *A* and *C*, will acquire nearly twice as much electricity as it did the firſt time, and of courſe will render the plate *C*, when that is laid upon it, proportionably more electrified than before: thus, by repeating this operation, the electricity may be increaſed to any required degree.

" The varniſh on thoſe ſurfaces of the plates which are to lie contiguous to each other, ſerves to prevent the metal of one touching the metal of the other; for in that caſe, inſtead of one plate cauſing a contrary electricity in the other, the electricity of the firſt would be gradually communicated to the others, and would be diſſipated.

" As ſoon as I underſtood the principle of this contrivance, I haſtened to conſtruct ſuch an apparatus, in order to try ſeveral experiments of a very delicate nature, eſpecially on animal bodies and vegetables, which could not have been attempted before, for want of a method of aſcertaining exceedingly ſmall quantities of electricity; but after a great deal of trouble, and many experiments, I was at laſt forced to conclude, that the doubler of electricity is not an inſtrument to be depended upon, for this principal reaſon, viz. becauſe it multiplies not only the electricity which is willingly communicated to it from the ſubſtance in queſtion; but it multiplies alſo that electricity which in the courſe of the operation is almoſt unavoidably produced by accidental friction; or that quantity of electricity, however ſmall it may be, which adheres to the plates in ſpite of every care and precaution.

" Having found, that with a doubler conſtructed in the above deſcribed manner, after doubling or multiplying

tiplying 20 or 30 times, it always became ſtrongly electrified, though no electricity had been communicated to it before the operation, and though every endeavour of depriving it of any adhering electricity had been practiſed; I naturally attributed that electricity which appeared after repeatedly doubling, to ſome friction given to the varniſh of the plates in the courſe of the operation. In order to avoid entirely this ſource of miſtake, or at leaſt of ſuſpicion, I conſtructed three plates without the leaſt varniſh, and which, of courſe, could not touch each other, but were to ſtand only within about one-eighth of an inch of each other. To effect this, each plate ſtood vertical, and was ſupported by two glaſs ſticks, which were covered with ſealing-wax. Theſe were inſerted into a wonden pedeſtal $7\frac{1}{2}$ inches long, $2\frac{1}{2}$ broad, and $1\frac{1}{4}$th inch thick, being kept faſt by cement both to the pedeſtal and likewiſe to another piece of wood faſtened to the back of the plate. The plate itſelf is of ſtrong tin, and meaſures about eight inches in diameter. The ſtand projects very little before the plate; by which means, when two of thoſe plates are placed upon a table facing each other, the wooden ſtands will prevent their coming into actual contact.

"I need not deſcribe the manner of doubling or of multiplying with thoſe plates; the operation being eſſentially the ſame as when the plates are conſtructed according to Mr Bennet's original plan, excepting that, inſtead of placing them one upon the other, mine are placed facing each other; and in performing the operation they are laid hold of by the wooden ſtand *AB*; ſo that no friction can take place either upon the glaſs legs or upon any varniſh; for theſe plates have no need of being varniſhed. Sometimes, inſtead of touching the plates themſelves with the finger, I have fixed a piece of thin wire to the back of the plate, and have then applied the finger to the extremity of the wire, ſuſpecting that ſome friction and ſome electricity might poſſibly be produced when the finger was applied in full contact to the plate itſelf.

"It is evident, that as the plates do not come ſo near to each other in this as they do in the other conſtruction, the electricity of one of them cannot produce ſo great a quantity of the contrary electricity in the oppoſite plate: hence, in this conſtruction, it will be neceſſary to continue the operation of doubling ſomewhat longer; but this diſadvantage is more than repaid by the certainty of avoiding any friction.

"Having conſtructed thoſe plates, I thought that I might proceed to perform the intended experiments without any further obſtruction: but in this I found myſelf quite miſtaken; for on trying to multiply with thoſe new plates, and when no electricity had been previouſly communicated to any of them, I found, that after doubling 10, 15, or at moſt 20 times, they became ſo full of electricity as to afford even ſparks. All my endeavours to deprive them of electricity proved ineffectual. Neither expoſing them, and eſpecially the glaſs ſticks, to the flame of burning paper, nor breathing upon them repeatedly, nor leaving them untouched for ſeveral days, and even for a whole month, during which time the plates remained connected with the ground by means of good conductors, nor any other precaution I could think of, was found capable of depriving them of every veſtige of electricity; ſo that they might ſhow none after doubling 10, 15, or at moſt 20 times.

"The electricity produced by them was not always of the ſame ſort; for ſometimes it was negative for two or three days together; at other times it was poſitive for two or three days more; and often it changed in every operation. This made me ſuſpect, that poſſibly the beginning of that electricity was derived from my body, and being communicated by the finger to the plate that was firſt touched, was afterwards multiplied. In order to clear this ſuſpicion, I actually tried thoſe plates at different times, viz. before and after having walked a great deal, before and after dinner, &c. noting very accurately the quality of the electricity produced each time; but the effects ſeemed to be quite unconnected with the above mentioned concomitant circumſtances; which independence was further confirmed by obſerving that the electricity produced by the plates was of a fluctuating nature, even when, inſtead of touching the plates with the finger, they had been touched with a wire, which was connected with the ground, and which I managed by means of an inſulating handle.

"At laſt, after a great variety of experiments, which it is unneceſſary to deſcribe, I became fully convinced, that thoſe plates did always retain a ſmall quantity of electricity, perhaps of that ſort with which they had been laſt electrified, and of which it was almoſt impoſſible to deprive them. The various quality of the electricity produced was owing to this, viz. that as one of thoſe plates was poſſeſſed of a ſmall quantity of poſitive electricity, and another was poſſeſſed of the negative electricity, that plate which happened to be the moſt powerful, occaſioned a contrary electricity in the other plate, and finally produced an accumulation of that particular ſort of electricity.

"Thoſe obſervations evidently ſhow, that no preciſe reſult can be obtained from the uſe of thoſe plates; and of courſe, that when conſtructed according to the original plan, they are ſtill more equivocal, becauſe they admit of more ſources of miſtake.

"As thoſe plates, after doubling or multiplying only four or five times, ſhow no ſigns of electricity, none having been communicated to them before, I imagined that they might be uſeful ſo far only, viz. that when a ſmall quantity of electricity is communicated to any of them in the courſe of ſome experiment, one might multiply it with ſafety four or five times, which would even be of advantage in various caſes; but in this alſo my expectations were diſappointed.

"Having obſerved, after many experiments, that, *cæteris paribus*, when I began to multiply from a certain plate, which we ſhall call *A*, the electricity which reſulted was generally poſitive; and when I began with another plate *B*, viz. conſidered this plate *B* as the firſt plate, the reſulting electricity was generally negative; I communicated ſome negative electricity to the plate *A*, with a view of deſtroying its inherent poſitive electricity. This plate *A* being now electrified negatively, but ſo weakly as juſt to affect an electrometer, I began doubling; but after having doubled three or four times, I found, by the help of an electrometer, that the communicated negative electricity in the plate was diminiſhed inſtead of being increaſed; ſo that ſometimes it vaniſhed entirely, though by continuing the operation

tion it often began to increaſe again, after a certain period. This ſhows, that the quantity of electricity, which however ſmall it may be, remains in a manner faſtened to the plates, will help either to increaſe or to diminiſh the accumulation or multiplication of the communicated electricity, according as it happens to be of the ſame or of a different nature.

"After all the above mentioned experiments made with thoſe doubling or multiplying plates, we may come to the following concluſion, viz. that the invention is very ingenious, but their uſe is by no means to be depended upon. It is to be wiſhed that they may be improved ſo as to obviate the weighty objections that have been mentioned; the firſt deſideratum being to conſtruct a ſet of ſuch plates as, when no electricity is communicated, they will produce none after having performed the operation of doubling for a certain number of times.

223 Cavallo's opinion of the methods by which ſmall quantities of electricity can be meaſured.

"Upon the whole, the methods by which ſmall quantities of electricity may be aſcertained with preciſion are, as far as I know, only three. If the abſolute quantity of electricity be ſmall and pretty well condenſed, as that produced by a ſmall tourmalin when heated, or by a hair when rubbed, the only effectual method of manifeſting its preſence, and aſcertaining its quality, is to communicate it immediately to a very delicate electrometer, viz. a very light one, that has no great extent of metallic or of other conducting ſubſtance; becauſe if the ſmall quantity of electricity that is communicated to it be expanded throughout a proportionably great ſurface, its elaſticity, and of courſe its power of ſeparating the corks of an electrometer, will be diminiſhed in the ſame proportion.

"The other caſe is, when one wants to aſcertain the preſence of a conſiderable quantity of electricity, which is diſperſed or expanded into a great ſpace, and is little condenſed, like the conſtant electricity of the atmoſphere in clear weather, or like the electricity which remains in a large Leyden phial after the firſt or ſecond diſcharge.

224 His apparatus for this purpoſe.

"To effect this, I uſe an apparatus, which in principle is nothing more than M. Volta's condenſer; but with certain alterations, which render it leſs efficacious than in the original plan, but at the ſame time render it much leſs ſubject to equivocal reſults. I place two of the above deſcribed tin-plates upon a table, facing each other, and about $\frac{1}{8}$th of an inch aſunder. One of thoſe plates, for inſtance *A*, is connected with the floor by means of a wire, and the other plate *B* is made to communicate, by any convenient means, with the electricity that is required to be collected. In this diſpoſition the plate *B*, on account of the proximity of the other plate, will imbibe more electricity than if it ſtood far from it, the plate *A* in this caſe acting like the ſemiconducting plane of M. Volta's condenſer, though not with quite an equal effect, becauſe the other plate *B* does not touch it; but yet, for the very ſame reaſon, this method is incomparably leſs ſubject to any equivocal reſult. When the plates have remained in the ſaid ſituation for the time that may be judged neceſſary, the communication between the plate *B* and the conducting ſubſtance which conveyed the electricity, muſt be diſcontinued by means of a glaſs ſtick, or other inſulating body; then the plate *A* is removed, and the plate *B* is preſented to an electrometer, in order to aſcertain the quality of the electricity; but if the electrometer be not affected by it, then the plate *B* is brought with its edge into contact with another very ſmall plate, which ſtands upon a ſemiconducting plane, after the manner of M. Volta's condenſer (N); which done, the ſmall plate, being held by its inſulating handle, is removed from the inferior plane, and is preſented to the electrometer: and it frequently happens, that the ſmall plate will affect the electrometer very ſenſibly, and quite ſufficient for the purpoſe; whereas the large plate itſelf ſhowed no clear ſigns of electricity.

"If it be aſked, why I uſe the ſemiconducting plane for this ſmall plate, and not for the large one? the anſwer is, firſt, becauſe the large ſemiconducting plane is incomparably more difficult to be procured than the ſmall one; and, ſecondly, becauſe the ſmall plane may be eaſily deprived of any accidental electricity which may adhere to it; but the large one is more difficultly rendered fit for the purpoſe, eſpecially as the large plate ought in geneaal to remain upon it a much longer time than the ſmall plate is to remain upon its ſemi-conducting plane.

"The third and laſt caſe is, when the electricity to be aſcertained is neither very conſiderable in quantity nor much condenſed; ſuch is the electricity of the hair of certain animals, of the ſurface of chocolate when cooling, &c. In this caſe the beſt method is to apply a metal plate, furniſhed with an inſulating handle, like an electrophorus plate, to the electrified body, and to touch this plate with a finger for a ſhort time whilſt ſtanding in that ſituation; which done, the plate is removed, and is brought near an electrometer; or its electricity may be communicated to the plate of a ſmall condenſer, as directed in the preceding caſe, which will render the electricity more conſpicuous. It is evident, that in this caſe the metal plate will acquire the electricity contrary to that of the ſubſtance in queſtion: but this anſwers the ſame purpoſe; for if the electricity of the plate be found to be poſitive, one muſt conclude, that the electricity of the body in queſtion is negative, and contrariwiſe. In this operation, care muſt be had not to put the metal plate too near, or in full contact with the ſubſtance to be examined, leſt the friction, likely to happen between the plate and the body, ſhould produce ſome electricity, the origin of which might be attributed to other cauſes.

"Having thus far deſcribed the ſureſt methods of aſcertaining the preſence and quality of electricity, when its quantity or degree of condenſation is ſmall, I ſhall now beg leave to add ſome farther remarks on the ſubject of electricity in general, and which have been principally ſuggeſted by what has been mentioned.

"On the hypotheſis of a ſingle electric fluid, it is ſaid, that every ſubſtance in nature, when not electrified

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(N) This ſmall plate is nearly of the ſize of a ſhilling, and the ſemiconducting plane is of wood covered with copal varniſh.

fied, contains its proper ſhare of electric fluid, which is proportionate to its bulk, or to ſome other of its properties; and it is generally believed, that this equal or proportionate diſtribution of electric fluid takes place with the greateſt part of natural bodies. However, the fact is far from being ſo; and I may venture to aſſert, that, ſtrictly ſpeaking, every ſubſtance is always electrified, *viz.* that every ſubſtance, and even the various parts of the ſame body, contain at all times more or leſs electric fluid than that quantity of it which it ought to contain, in order to be in an electrical equilibrium with the bodies that ſurround it.

“ At firſt ſight it may be thought quite immaterial to know, whether the electric fluid is diſperſed in the juſt proportion among the various ſubſtances which are not looked upon as electrified, or whether it deviates in a ſmall degree from that proportionate diſtribution; but it will hereafter appear, that one of thoſe aſſertions will lead us to the explanation of an intereſting phænomenon in electricity, whereas the other does not admit of it; beſides, what is called a ſmall difference of the proportionate diſtribution, inſomuch as it does not affect our inſtruments, may be ſufficient for ſeveral operations of nature, which it is our intereſt to inveſtigate.

“ If we inquire what phenomena evince this altered diſtribution, or the actually electrified ſtate of all bodies, the preceding obſervations will furniſh ſome very unequivocal ones; eſpecially that of the doubling plates made after my plan, which ſhowed to be electrified even after having remained untouched for a whole month, during which time they had been in communication with the ground; for if each of them had contained an equal ſhare of electric fluid, the electric atmoſphere of one of them could not poſſibly occaſion a contrary electricity in the other, and conſequently no accumulation of that power could have happened.

“ A great number of inſtances are related in books on the ſubject of electricity, and in the Phil. Tranſ. of pieces of glaſs, of ſulphur, of ſealing-wax, &c. having remained electrified ſo far as to affect an electrometer for months after they had been excited, or even touched; but the following experiment will ſhow, in a clearer manner, the great length of time that a quantity of electricity will remain upon a body.

“ Having conſtructed a gold-leaf electrometer in the niceſt manner I could, and which, on account of the non-conducting nature and conſtruction of its upper part, could remain ſenſibly electrified for ſeveral hours together, I communicated ſome electricity to it, which cauſed the ſlips of gold-leaf to diverge with a certain angle; and as the electricity was gradually diſſipated, the divergency diminiſhed in the ſame proportion. Now, whilſt this diminution of divergency was going on, I looked through a ſmall teleſcope, and, by means of a micrometer, meaſured the chords of the angles of divergency, ſetting down the time elapſed between each pair of contiguous obſervations; and as the chord of the angle of divarication is in the direct ſimple proportion of the denſity of the electric fluid (A), I could by this means know how much electric fluid was loſt by the electrometer in a certain time, and of courſe what portion of the electricity firſt communicated to the electrometer ſtill remained in it. Let us make the chord of the angle of divarication on firſt electrifying the electrometer, or rather when firſt obſerved, equal to 16; or let us conceive that quantity of electricity to be diviſible into 16 equal parts.

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“ I obſerved, that, when the chord of the angle became equal to eight, the time elapſed between this and the firſt obſervation was one minute; when the chord became equal to four, the time elapſed between this point and the preceding obſervation was 3′ 30″; when the chord became equal to two, the time elapſed ſince the preceding obſervation was 17′; and when the chord became equal to one, the time elapſed ſince the preceding obſervation was one hour and a quarter; after which the electrometer remained ſenſibly electrified for a long time.

“ In repeating this experiment, the times elapſed between the correſponding obſervations did not follow ſtrictly the ſame proportion of increaſe; nor did they increaſe regularly in the ſame experiments, which may be attributed in great meaſure to the inaccuracy in obſerving, and to the fluctuating ſtate of the air; but it could be ſafely inferred from all the experiments, that the times required for the diſperſion of the electricity were at leaſt greater than the inverſe duplicate proportion of the denſities of the electricity remaining in the electrometer. And if we imagine, that they continue to diminiſh in the ſame proportion of increaſing time, which is far from being an extravagant ſuppoſition, we ſhall find, by a very eaſy calculation, that about two years after the electrometer would ſtill retain the $\frac{1}{100}$th part of the electricity communicated to it in the beginning of the experiment; and as we do not know how far a quantity of electricity is diviſible, or to what extent it may be expanded, we may conclude with ſaying, that ſtrictly ſpeaking the electrometer would remain electrified for many years.

“ It may be inferred from this, as well as from many other experiments, that the air, or in general any ſubſtance, is a more or leſs perfect conductor of electricity, according as the electricity which is to paſs through it is more or leſs condenſed; ſo that if a given quantity of electric fluid be communicated to a ſmall braſs ball, one may take it away by ſimply touching the ball with a finger; but if the ſame quantity of electric fluid be communicated to a ſurface of about 100 or 1000 ſquare feet, the touching with the finger will hardly take away any part of it.

“ If it be aſked, what power communicates the electricity, or originally diſturbs the equilibrium of the natural quantity of electric fluid in the various bodies of the univerſe? we may anſwer, that the fluctuating electric ſtate of the air, the paſſage of electrified clouds, the evaporation and condenſation of fluids, and the friction ariſing from divers cauſes, are perpetually acting upon the electric fluid of all bodies, ſo as either to increaſe or diminiſh it, and that to a more conſiderable degree than is generally imagined.

“ I ſhall conclude, with briefly propoſing an explanation of the production of electricity by friction, which is dependent upon the above ſtated propoſition,

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(A) This propoſition was firſt aſcertained by F. Beccaria. See Philoſophical Tranſactions, Vol. LVI.

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*viz.* that bodies are always electrified in ſome degree; and likewiſe upon the well known principle of the capacity of bodies for holding electric fluid being increaſed by the proximity of other bodies in certain circumſtances.

"It ſeems to me, that the cylinder of an electrical machine muſt always retain ſome electricity of the poſitive kind, though not equally denſe in every part of its ſurface; therefore, when one part of it is ſet contiguous to the rubber, it muſt induce a negative electricity in the rubber. Now, when, by turning the cylinder, another part of it (which ſuppoſe to have a leſs quantity of poſitive electricity than the preceding) comes quickly againſt the rubber; the rubber being already negative, and not being capable of loſing that electricity very quickly, muſt induce a ſtronger poſitive electricity in the former part which is now oppoſite to it: but this part cannot become more poſitively electrified, unleſs it receives the electric fluid from ſome other body, and therefore ſome quantity of electric fluid paſſes from the loweſt part of the rubber to this part of the glaſs; which additional quantity of electric fluid is retained by it alone only whilſt it remains in contact with the rubber; for after that, its capacity being diminiſhed, the electric fluid endeavours to eſcape from it. Thus we may conceive how every other part of the glaſs acquires the electric fluid, &c. and what is ſaid of the cylinder of an electrical machine may, with proper changes, be applied to any other electric and its rubber."

227 Cavallo's inſtrument for obſerving ſmall quantities of electricity.

An inſtrument for obſerving very ſmall quantities of electricity has likewiſe been invented by the ſame author, and deſcribed in the ſecond part of the volume juſt quoted. The properties of this machine, which from its office may be called *a collector of electricity*, are, *firſt*, that when connected with the atmoſphere, the rain, or in ſhort with any body which produces electricity ſlowly, or which contains that power in a very rarefied manner, it collects the electricity, and afterwards renders both the preſence and quality of it manifeſt, by communicating it to an electrometer. 2*dly*, This collecting power, by increaſing the ſize of the inſtrument, and eſpecially by uſing a ſecond or ſmaller inſtrument of the like ſort to collect the electricity from the former, may be augmented to any degree. 3*dly*, It is conſtructed, managed, and preſerved with eaſe and certainty; and it never gives, nor can it give, an equivocal reſult, as he has proved experimentally, and as will appear by conſidering its conſtruction.

Plate CLXXVIII. exhibits two perſpective views of this collector. Fig. 93. ſhows the inſtrument in the ſtate of collecting the electricity; and fig. 94. ſhows it in the ſtate in which the collected electricity is to be rendered manifeſt. An electrometer is annexed to each. The letters of reference indicate the ſame parts in both figures.

*ABCD* is a flat tin plate, 13 inches long and 8 inches broad; to the two ſhorter ſides of which are ſoldered two tin tubes *AD* and *BC*, which are open at both ends. *DE* and *CF* are two glaſs ſticks covered with ſealing-wax by means of heat, and not by diſſolving the ſealing-wax in ſpirits. They are cemented into the lower apertures of the tin tubes, and alſo in the wooden bottom of the frame or machine at *E* and *F*; ſo that the tin plate *ABCD* is ſupported by thoſe glaſs ſticks in a vertical poſition, and is exceedingly well inſulated. *GHILKM* and *NOPV* are two frames of wood, which being faſtened to the bottom-boards by means of braſs hinges, may be placed ſo as to ſtand in an upright poſition and parallel to the tin-plate, as ſhown in fig. 94. or they may be opened, and laid upon the table which ſupports the inſtrument, as ſhown in fig. 93. The inward ſurfaces of thoſe frames from their middle upwards are covered with gilt paper *XY*; but it would be better to cover them with tin-plates hammered very flat. When the lateral frames ſtand ſtraight up, they do not touch the tin plate; but they ſtand at about one-fifth part of an inch aſunder. They are alſo a little ſhorter than the tin-plate, in order that they might not touch the tin-tubes *AD*, *BC*. In the middle of the upper part of each lateral frame is a ſmall flat piece of wood *S* and *T*, with a braſs hook; the uſe of which is to hold up the frames without the danger of their falling down when not required, and at the ſame time it prevents their coming nearer to the tin-plate than the proper limit. It is evident, that when the inſtrument ſtands as ſhown in fig. 94. the gilt ſurface of the paper *XY*, which covers the inſide of the lateral frames, ſtands contiguous and parallel to the tin-plate.

Method meaſuri Electric &c.

When the inſtrument is to be uſed, it muſt be placed upon a table, a window, or other convenient ſupport; a bottle electrometer is placed near it, and is connected, by means of a wire, with one of the tin tubes *AD*, *BC*; and by another conducting communication the tin-plate muſt be connected with the electrified ſubſtance, the electricity of which is required to be collected on the plate *ABCD*: thus, for inſtance, if it be required to collect the electricity of the rain or of the air, the inſtrument being placed near a window, a long wire muſt be put with one extremity into the aperture *A* or *B* of one of the tin-tubes, and with the other extremity projecting out of the window. If it be required to collect the electricity produced by evaporation, a ſmall tin pan, having a wire or foot of about ſix inches in length, muſt be put upon one of the tin-tubes, ſo that, the wire going into the tube, the pan may ſtand about two or three inches above the inſtrument. A lighted coal is then put into the pan, and a few drops of water poured upon it will produce the deſired effect. Thus far may ſuffice with reſpect to the mechanical deſcription of the inſtrument: the power and uſe of it will be made apparent by the following experiments.

1. Communicate to the tin-plate *ABCD* a quantity of electricity, for inſtance, as much as would very ſenſibly affect a common cork-ball electrometer; then, if the lateral frames *GHM*, *NOP*, ſtand upright, as in fig. 94. the electrometer *W* will ſhow no divergency; but if the frames are opened and let down, as in fig. 93. the balls of the electrometer *W* will immediately repel each other, and by the approach of an excited piece of ſealing-wax, the quality of the electricity may be eaſily aſcertained after the uſual manner. Put up the lateral frames again, and the electricity will apparently vaniſh; let them down, and the electricity will re-appear, and ſo on. If you touch any part of the tin-plate or tin-tubes with your finger, the electricity is thereby entirely removed, and that will be the caſe whether the lateral frames are up or down.

2. Take an extended piece of tin-foil, about four yards ſquare, and, holding it by a ſilk thread, electrify it ſo weakly as not to be capable of affecting an electrometer; then bring it in contact with the tin-plate of the collector, whilſt the lateral frames are up. This done, remove the tin-foil, let down the lateral frames one after the other; and on doing this the electrometer *W* will immediately manifeſt a conſiderable degree of electricity. But if the electrometer were to ſhow no ſenſible degree of electricity, a ſmaller collector, *viz.* one having a tin-plate of about four ſquare inches, muſt be brought into contact with the tin-plate of the large collector, whilſt the lateral frames of the latter only are down; and then the ſmall collector being removed from the large one, its lateral frames are opened, and its tin-plate is preſented to an electrometer, which will thereby be electrified to a much greater degree than the electrometer *W* was by the large collector.

3. Let a common cork-ball electrometer be faſtened to an inſulated conductor, having about two or three ſquare feet of ſurface, and communicate to it ſuch a quantity of electricity as may be ſufficient to let the balls of the electrometer ſtand at about one inch aſunder. In this ſtate bring the conductor in contact with the tin-plate of the collector for a very ſhort time, and it will be found, that the balls of its electrometer will immediately approach and touch each other, ſhowing that the electricity of the conductor is gone to the plate of the collector; and, in fact, if you let down the lateral frames, the balls of the electrometer *W* will immediately repel each other to a very great degree.

It ſeems, therefore, to be clearly ſhown by theſe experiments, that the tin-plate of this inſtrument can collect and retain a vaſt quantity of electricity, when the conducting ſurfaces of the lateral frames are contiguous to it, in compariſon to that quantity which it can either collect or retain when thoſe ſurfaces are removed from its vicinity.

The quantity of electricity which the tin-plate *ABCD* is capable of collecting, principally depends on three circumſtances, *viz.* 1ſt, on the diſtance between the tin-plate and the conducting lateral ſurfaces; the ſmaller that diſtance is, the greater being the collecting power: 2dly, on the ſize of the inſtrument: and, 3dly, on the quantity of electricity poſſeſſed by the body from which it muſt be collected or taken away

The principle upon which the action of this inſtrument depends, is the ſame as that of the electrophorus of M. Volta's condenſer, and of many other electrical experiments; namely, that a body has a much greater capacity for holding electricity when its ſurface is contiguous to a conductor which can eaſily acquire the contrary electricity, than when it ſtands not in that ſituation.

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The electrical air thermometer, fig. 34. is an inſtrument deſigned to ſhow the power of electricity by its rarefaction of the air through which the fluid paſſes. But though this inſtrument in theory might be ſuppoſed capable of manifeſting the very leaſt degrees of electricity, the rarefaction of the air by its means is ſo very ſmall, that unleſs the power of electricity be very conſiderable, no expanſion will be perceived. The inſtrument, however, certainly has its uſes, and many curious experiments may be performed with it. *A B* repreſents a glaſs cylinder having a braſs cap, with a wire and knob paſſing through it, and which is cemented on the open part of the glaſs. The under part is inverted into a ſmall diſh *B C*, containing quickſilver or ſome other liquid, which may riſe in the ſmall tube *A H* by any expanſion of the air in the cylinder *A B*. *C D* is an inſulating ſtand, which ſerves to ſuſtain the whole; *E* is an hook by which a communication may be made to the ground; and *F* another for connecting the whole with the prime conductor of an electrical machine. The diſcharges of electricity made by the ſparks between the knobs *G* and *I* expand the air, and force up the fluid into the ſmall tube *A H;* and its riſe there is marked upon a graduated ſcale. This inſtrument will likewiſe anſwer for ſhowing the diminution or increaſe of any kind of air by the electric ſpark, as well as its ſudden expanſion by a ſpark or ſhock of a phial. Mr Morgan has ſhown that the mercury in a common thermometer, if well made, may be raiſed by the electric blaſt.

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Mr Bennet's doubler of electricity improved by Nicholſon.

In a treatiſe lately publiſhed by the Reverend Mr Abraham Bennet, he gives an account of the machine called the *doubler of electricity*, with ſome improvements upon it by Mr Nicholſon; by which means the machine becomes leſs liable to the objections of Mr Cavallo above-mentioned. In its improved ſtate, it conſiſts of two inſulated and immoveable plates about two inches in diameter, and a moveable plate alſo inſulated, which revolves in a vertical plane parallel to the two immoveable plates, paſſing them alternately.

Plate CLXXVI. Fig. 65.

" The plate *A* is conſtantly inſulated, and receives the communicated electricity. The plate *B* revolves; and when it is oppoſite the plate *A*, the connecting wires at the end of the croſs piece *D* muſt touch the pins of *A* and *C* at *EF*, and a wire proceeding from the plate *B* muſt touch the middle piece *G*, which is ſupported by a braſs, wooden, or other conducting pillar in connection with the earth. In this poſition, if electricity be communicated to the plate *A*, the plate *B* will acquire a contrary ſtate; and paſſing forwards, the wires alſo moving with it by means of the ſame inſulating axis, the plates are again inſulated till the plate *B* is oppoſite to *C*, and then the wire at *H* touches the pin in *C*, connecting it with the earth, and communicating the contrary ſtate of electricity to that of *B*, but of the ſame kind with that of *A*. By moving the handle ſtill further, *B* is again brought oppoſite to *A*; and the connecting wires joining *A* and *C*, they both act upon *B*, which is connected with the earth as before, and nearly double its intenſity, whilſt the electricity of *C* is abſorbed into *A;* becauſe of the increaſed capacity of *A*, whilſt oppoſed to *B*, capable by its connection with the earth of acquiring a contrary ſtate ſufficient to balance the influential atmoſpheres of both plates.

" Thus by continuing to revolve the plate *B*, the proceſs is performed in a very expeditious and accurate manner.

" The ball *I* is made heavier on one ſide than the other, and ſcrewed upon the axis oppoſite to the handle, to counterbalance the plate *B*, which may therefore be ſtopped in any part of its revolution.

" Yet notwithſtanding the convenience and accuracy of this doubler, it always produced ſpontaneous electricity,

city, even after all the reſinous ſubſtances uſed in its conſtruction had been melted over a candle, and after ſtanding a long time with its plates in connection with the earth. I therefore conjectured that this ſpontaneous electricity was not owing to accidental friction, but to the increaſed capacity of approximating parallel plates which might attract and retain their charge tho' neither of them were inſulated. To prove my hypotheſis, I firſt endeavoured more effectually and ſpeedily to deprive the inſtrument of the electricity laſt communicated, and that I might know whether this ſpontaneous charge, ſuppoſed to ariſe from the increaſed capacity of the parallel plates, would be always of the ſame kind.

"To effect this deprivation, I connected the plates *A* and *C* together by a wire hooked at each end upon two ſmall knobs on the backs of the plates, the middle of the ſame wire touching the pillar which ſupports the doubler. Another wire was hooked at one end upon the back of the plate *B*, and at the other end to the braſs ball which counterbalances this plate. Thus all the plates were connected with the earth; and by turning the handle of the doubler, it might be diſcharged of electricity in every part of its revolution.

"After often trying this method of depriving the doubler, I obſerved that its ſpontaneous charge was almoſt always negative. I then touched *A* and *C* with a poſitively charged bottle, and turned the doubler till it produced ſparks for a long time together; and after this ſtrong poſitive charge, I hooked on the wires as above, and revolved the plate *B* about 100 times, which ſo deprived the doubler of its poſitive electricity, that when the wires were taken off, it produced a negative charge at about the ſame number of revolutions which it required before.

"The poſitively charged bottle was again applied; and the wires being hooked upon the plates as before, *B* was revolved only 50 times; yet this was found ſufficient to deprive it of its poſitive charge, and in many experiments 5 or 6 revolutions were ſufficient: but I never thought it ſafe to ſtop at ſo few, and have therefore generally turned the handle 40 or 50 times between every experiment.

"Leſt electricity adhering to the electrometer ſhould obſtruct the above experiments, I did not let it ſtand in contact with the doubler during its revolutions, but touched the plate *A* with the cap of the electrometer, after I ſuppoſed its electricity was become ſufficiently ſenſible: but leſt even this contact ſhould communicate any electricity, I made a cap for my electrometer of ſhell-lac, having a ſmall tin tube in the centre, to which the gold leaf was ſuſpended within the glaſs, and a bent wire was fixed to the top, which might eaſily be joined to the plate *A* of the doubler; and thus the gold-leaf was more perfectly inſulated, and the electricity could not be diffuſed over ſo large a ſurface. The glaſs which inſulates the plates and croſs piece of the doubler was alſo covered with ſhell-lac."

230 Nicholſon's inſtrument for diſtinguiſhing the two electricities.

Fig. 66. ſhows an inſtrument invented by Mr Nicholſon for diſtinguiſhing the two electricities from one another. *A* and *B* are two metallic balls placed at a greater or leſs diſtance from each other by means of the joint at *C*; the two branches *C A* being made of varniſhed glaſs. From one of the balls *B* proceeds a ſhort point towards the other ball *A*. If the two be placed in the courſe or current of the electric matter, ſo that it may paſs through the air from one to the other, its direction will be known. For if the electric matter paſs from *A* to *B*, there will be a certain diſtance of the balls dependent on the ſtrength of electricity, within which the denſe ſparks will paſs from the point; but if its courſe be in the contrary direction, no ſpark will be ſeen, unleſs the balls be almoſt in contact with the point.

23 Obſerv tion, o uſe of electri kite.

We ſhall conclude this ſection with ſome obſervations on the electrical kite; which perhaps may after all be found the only inſtrument that will certainly ſhow the electricity of the atmoſphere upon all occaſions. The uſe of it, however, is very troubleſome, as it obliges the obſerver always to go abroad, which ſometimes muſt be diſagreeable. By means of the apparatus repreſented fig. 72. this inconvenience may be avoided. *A B* repreſents the ſtring of the kite, inſulated by means of the ſilk cord *C*, tied about the foot of a table in the room where the experiments are to be made. This ſtring paſſes out through a window of the room, and ſupports the kite; the electricity being conveyed by means of a ſmall wire to the inſulated conductor *D*, having a quadrant electrometer applied to it, as in the figure. *G* is a glaſs tube about 18 inches long, with a braſs wire and knob proceeding from it; by taking a ſmall ſpark with which from the conductor, the quality of the electricity may be obſerved.

Pla CLX

23 A con ent po electro ter.

Fig. 68. 69. repreſent a pocket electrometer, which may be very conveniently uſed when the atmoſpheric electricity is collected in any quantity. The caſe or handle of this electrometer is formed by a glaſs tube about three inches long and $\frac{1}{10}$ths of an inch in diameter, half of which is covered with ſealing-wax. From one extremity of this tube, *viz.* that without ſealing-wax, a ſmall loop of ſilk proceeds, which ſerves occaſionally to hang the electrometer on a pin, &c. To the other extremity of the tube a cork is adapted, which, being cut tapering on both ends, can fit the mouth of the tube with either end. From one extremity of this cork two linen threads proceed, a little ſhorter than the length of the tube, ſuſpending each a little cone of pith of alder. When this electrometer is to be uſed, that end of the cork which is oppoſite to the threads is puſhed into the mouth of the tube; then the tube forms the inſulated handle of the pith electrometer, as repreſented fig. 69. But when the electrometer is to be carried in the pocket, then the threads are put into the tube, and the cork ſtops it as repreſented fig. 68. The peculiar advantages of this electrometer are, its convenient ſmall ſize, its great ſenſibility, and its continuing longer in good order than any other. Fig. 68. repreſents a caſe to carry the above deſcribed electrometer in. This caſe is like a common toothpike-caſe, except that it hath a piece of amber fixed on one extremity *A*, which may occaſionally ſerve to electriſy the electrometer negatively; and on the other extremity it hath a piece of ivory faſtened upon a piece of amber *B C*. This amber *B C* ſerves only to inſulate the ivory; which when inſulated, and rubbed againſt woollen cloths, acquires a poſitive electricity, and is therefore uſeful to electriſy the electrometer poſitively.

In making experiments with the kite, it is ſometimes neceſſary to act with caution, on account of the

the great quantity of electricity collected by it. Of this we have already given ſome inſtances, to which we ſhall add the following from Mr Bennet; viz. that having on the 5th of July 1788 raiſed a kite with 200 yards of ſtring, when it had been flying about an hour, a dark cloud appeared at a great diſtance, and changed the electricity from poſitive to negative. The electric power increaſed till the cloud became nearly vertical, when ſome large drops of rain fell; and our author attempting to ſecure the ſtring from wet, received ſuch a ſtrong ſhock in his arm, as deprived it for a few ſeconds of ſenſation. The exploſion was heard at the diſtance of about 40 yards, like the loud crack of a whip.

### Sect. XI. *Of the Effects of Electricity on Vegetation.*

It is a very conſiderable time ſince electricians began to make experiments on this ſubject; and it was generally agreed that the electric fluid was favourable to the growth of vegetables. For a long time, however, ſuch reſearches ſeem to have been laid aſide; nor indeed did it ſeem very probable that any quantity of the fluid could be collected artificially ſufficient to be of uſe. But in a late treatiſe the ſubject has been revived by the Abbe Bertholon; who not only ſhows a method of collecting the fluid from the atmoſphere ſo as to be uſeful in ordinary practice, but endeavours to cure by means of this fluid ſome of thoſe diſeaſes to which plants are liable from inſects, and which cannot be removed by any of the ordinary remedies.

“ In the firſt place (ſays the Abbé), there is continually and every where diffuſed in the atmoſphere (particularly in the upper regions) a conſiderable quantity of the electric fluid. On the mountains eſpecially, it is always felt with moſt energy, and ſhows itſelf in greater abundance than on the plains. On the former, if you erect conductors, or lanch electric *paper-kites*, in order to ſeek out and direct this fluid towards the ſurface of the earth, where ſeveral cauſes ſometimes prevent its appearance; you will find it very ſoon ſubjected to your power, deſcend, as if at your command, from heaven itſelf, and creep at your feet to execute your orders. Theſe are facts extremely well aſcertained; but if one doubts of them, he has nothing to do but to erect a ſimilar apparatus or ſet off electric kites to be convinced of the truth. Theſe will immediately and at all times obtain an electricity ſo much the more ſtrong as the height of the apparatus ſhall be the more conſiderable. Being informed, that in England this experiment was tried with the moſt convincing effect, I mention it, as it has hitherto not been publiſhed. Upon a high mountain there were lanched two electric paper-kites, one of which was fixed to the inferior extremity of the other, thus gaining a double advantage in point of height; the conſequence of which was, that the electric effects were incomparably greater than thoſe produced by a ſingle inſtrument. But I ſuppoſe it entirely uſeleſs to inſiſt longer upon a fact ſo well demonſtrated and univerſally admitted.

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“ This principle being granted: in order to remedy the deficiency of electric fluid which has already been proved to be hurtful to vegetation, we muſt erect in the ſpot which we want to fecundate the following new apparatus, which has had all poſſible ſucceſs, and which I ſhall call by the name of the *electro-vegetometer*. This machine is as ſimple in its conſtruction as efficacious in its manner of acting; and I doubt not but it will be adopted by all thoſe who are ſufficiently inſtructed in the great principles of nature.

“ This apparatus is compoſed of a maſt *AB* (Plate CLXXX. fig. 82.), or a long pole thruſt juſt ſo far into the earth as to ſtand firm and be able to reſiſt the winds. That part of the maſt which is to be in the earth muſt be well dried at the fire; and you muſt take care to lay on it a good coat of pitch and tar after taking it from the fire, that the reſinous particles may enter more deeply into the pores of the wood, which will then be dilated, at the ſame time that its humidity will be expelled by the heat. Care muſt likewiſe be taken to throw around that part fixed in the earth a certain quantity of coal-duſt, or rather a thick layer of good cement, and to build beſides a baſe of maſonwork of a thickneſs and depth proportionable to the elevation of the inſtrument, ſo as to keep it durable and ſolid. As to the portion of it above the ground, it will be ſufficient to put upon it ſome coats of oil paint, except one chooſes rather to lay on a coat of bitumen the whole length of the piece.

“ At the top of the maſt there is to be put an iron conſole or ſupport *C*; whoſe pointed extremity you are to fix in the upper end of the maſt, while the other extremity is to terminate in a ring, in order to receive the hollow glaſs-tube which is ſeen at *D*, and in which there is to be glued an iron rod riſing with the point *E*. This rod, thus pointed at its upper extremity, is completely inſulated, by reaſon of its keeping a ſtrong hold of a thick glaſs-tube, which is filled with a quantity of bituminous matter, mixed with charcoal, brick-duſt, and glaſs-powder; all together forming a ſufficiently good and ſtrong cement for the object in view.

To prevent rain wetting the glaſs tube, care muſt be taken to ſolder to the rod *E* a funnel of white-iron; which conſequently is entirely inſulated. From the lower extremity of the rod *E* hangs a chain *G*, which enters into a ſecond glaſs-tube *H*, ſupported by the prop *I*. The lower end of the above-mentioned chain reſts upon a circular piece of iron-wire, which forms a part of the horizontal conductor *KLMN*. In *L* is a breaker with a turning joint or hinge, in order to move to the right or left the iron-rod *LMN*; there is likewiſe another in *Q*, to give ſtill greater effect to the circular movement. *O* and *P* are two ſupports terminating in a fork, where there is fixed a ſilken cord tightly ſtretched, in order to inſulate the horizontal conductor: in *N* are ſeveral very ſharp iron-points.

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Another form of this inſtrument.

“ In fig. 83. you ſee an apparatus in the main like the former, but with ſome difference in the conſtruction. At the upper extremity of the maſt *ab* there is bored a hole into which enters a wooden cylinder *c*, which has been carefully dried before a great fire, in order to extract its humidity, dilate its pores, and ſaturate it with tar, pitch, or turpentine, applied at repeated intervals. The more heat the wood and bituminous matter receives, the more the ſubſtance penetrates, and the inſulation will be the more complete. It is moreover proper to beſmear the circumference of the little cylinder with a pretty thick coat of bitumen. This preparation being made, we next inſert the cylinder *c*

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into the hole *b* of the maſt; and it is eaſy to join together theſe two wooden pieces in the moſt perfect manner.

"At the upper extremity of the cylinder *c* we ſtrongly attach an iron-rod *g f*; which, inſtead of one, is terminated by ſeveral ſharp points all of gilded iron. In *e* you ſee a branch of iron reſembling the arm of an iron-crow, from whence hangs an iron chain *h i*, at the end of which there is hooked a piece of iron reſembling a maſon's ſquare, and ending in a fork. The piece of iron *l* is a ring with a handle entering a little into the glaſs-tube *m* filled with maſtiche, in the ſame manner as does the iron-rod *n*. The conductor *p o* is to be conſidered as an additional piece to act in that marked *p*. There are likewiſe put iron-ſpikes in *q*: the ſupport *s* reſembles thoſe of *O* and *P* in the former figure. In this new machine you can lengthen or ſhorten the horizontal conductor as you pleaſe; and as the iron-ring *l* turns freely in a circular gorge made in the maſt, the conductor is enabled to deſcribe the entire area of a circle.

237 Effects of theſe inſtruments.

"The conſtruction of this *electro-vegetometer* once well underſtood, it will be eaſy for us to conceive its effects. The electricity which prevails in the aerial regions will ſoon be drawn down by the elevated points of the upper extremity. This effect of the points is proved by the moſt deciſive experiments, and is called by philoſophers the *power of the points*.

"The electric matter brought down by the point *E*, or by thoſe marked *f f f*, will be neceſſarily tranſmitted both by the rod and chain; becauſe the inſulation produced at the upper extremity of the maſt completely prevents its communication with the timber. The electric fluid paſſes from the chain to the horizontal conductor *K M* or *n o*: it then eſcapes by the points at *P* and *q*; becauſe the ſame points that have the power of bringing down the electric fluid, have likewiſe that of puſhing it forward; a thing well known by experience.

238 Method of uſing them.

"The manner of uſing this inſtrument is not more difficult than the knowledge either of its conductor or effects. Suppoſe, for example, we are to place it in the midſt of a kitchen-garden. By making the horizontal conductor turn round ſucceſſively, you will be able to carry the electricity over the whole ſurface of the propoſed ground. The electric fluid thus drawn down, will extend itſelf over all the plants you want to cultivate; and this at a time when there is little or no electricity in the lower regions nigh the ſurface of the earth.

"On the other hand, when it happens that the electric fluid ſhall be in too great abundance in the atmoſphere, in order to take off the effect of the apparatus in *K* fig. 82. and in *n* fig. 83. you have only to hang to it an iron-chain reaching to the ground, or elſe a perpendicular iron-rod, which will have the ſame effect *viz.* that of deſtroying the inſulation, and of inſenſibly tranſmitting the electric fluid in the ſame proportion as it is drawn by the points; ſo that there ſhall never be an overcharge of this fluid in the inſtrument, and its effect ſhall be either ſomething or nothing, according as you add or remove the ſecond chain or the additional rod.

"There will be nothing to fear from the ſpontaneous diſcharge of this apparatus, becauſe it is terminated below by proper points in *P* and *q* of both machines; and it is a certain fact, that a pointed conductor makes no exploſion, and that inſtead of flaſhes there are only luminous ſtreams. However, it will be eaſy to furniſh one, by means of which we may approach the apparatus with perfect ſecurity; it is only neceſſary to hold the hand before it. This has the form of a great C, and is of a height equal to the diſtance that takes place betwixt the horizontal conductor and the ſurface of the earth. This diſcharger near the middle muſt be furniſhed with a glaſs-handle; and at that extremity which is directed towards the conductor, there muſt hang an iron-chain made to trail on the ground. This inſtrument is an excellent ſafeguard. See fig. 84.

Effe Elect on V

23 Grea vanta to be pecte theſe ſtrum

"By means of the electro-vegetometer juſt now deſcribed, one may be able to accumulate at pleaſure this wonderful fluid, however diffuſed in the regions above, and conduct it to the ſurface of the earth, in thoſe ſeaſons when it is either ſcantily ſupplied, or its quantity is inſufficient for vegetation; or although it may be in ſome degree ſufficient, yet can never produce the effects of a multiplied and highly increaſed vegetation. So that by theſe means we ſhall have an excellent vegetable manure or nouriſhment brought down as it were from heaven, and that too at an eaſy expence; for after the conſtruction of this inſtrument, it will coſt you nothing to maintain it: It will be moreover the moſt efficacious you can employ, no other ſubſtance being ſo active, penetrating, or conducive to the germination, growth, multiplication, or reproduction of vegetables. This heavenly manure is that which nature employs over the whole habitable earth; not excepting even theſe regions which are eſteemed barren, but which, however, are often fecundated by thoſe agents which nature knows ſo well to employ to the moſt uſeful purpoſes. Perhaps there was nothing wanting to bring to a completion the uſeful diſcoveries that have been made in electricity, but to ſhow this ſo advantageous an art of employing electricity as a manure; conſequently, that all the effects which we have already mentioned, depend upon electricity alone; and laſtly, that all theſe effects, *viz.* acceleration in the germination, the growth, and production of leaves, flowers, fruit, and their multiplication, &c. will be produced, even at a time when ſecondary cauſes are againſt it: and all this is brought about by the electric fluid, which we have the art of accumulating over certain portions of the earth where we want to raiſe thoſe plants that are moſt calculated for our uſe. By multiplying theſe inſtruments, which are provided at no expence (ſince iron-rods of the thickneſs of one's finger, and even leſs, are ſufficient for the purpoſe), we multiply their beneficial effects, and extend their uſe *ad infinitum*.

"This apparatus having been raiſed with care in the midſt of a garden, the happieſt effects were perceived, *viz.* different plants, herbs, and fruits, in greater forwardneſs than uſual, more multiplied, and of better quality. At the ſame time it was obſervable, that, during the night, the points *P* and *q*, as well as the upper extremities, were often garniſhed with beautiful luminous ſparks. Theſe facts are analogous to an obſervation which I have often made, *viz.* that plants grow beſt and are moſt vigorous near thunder-rods, where their ſituation favours their developement. They like-

Vege rous rods.

likewiſe ſerve to explain why vegetation is ſo vigorous in lofty foreſts, and where the trees raiſe their heads far from the ſurface of the earth, ſo that they ſeek, as it were, the electric fluid at a far greater height than plants leſs elevated; while the ſharp extremities of their leaves, boughs, and branches, ſerve as ſo many points granted them by the munificent hand of nature, to draw down from the atmoſphere that electric fluid, which is ſo powerful an agent in forwarding vegetation, and in promoting the different functions of plants.

“ This electro-vegetometer may be ſet up not only in a kitchen-garden, but in an orchard, in a field of corn, olive-yard, &c. &c. Everywhere the ſame effects are produced, namely, fecundity in the ſoil, quickneſs of vegetation, increaſe of produce, ſuperiority in the quality, &c. This machine is applicable to all kinds of vegetable productions, to all places, and all ſeaſons; and if I am to believe the moſt enlightened and intelligent of my friends, the electro-vegetometer is one of the moſt noble and uſeful diſcoveries that have been made in the preſent century.

“ Beſides the advantages of the electro-vegetometer, of which we have been ſpeaking above, there is ſtill another very important one, namely, that by applying to it a large electrometer or grand conductor, we may thus find out the electricity of the atmoſphere. For this purpoſe we muſt take away the points *HR* (fig. 82. and *r*. fig. 83.) which are ſeen in *Rr*. This machine will likewiſe ſerve the purpoſe of a thunder-rod, if one takes care to thruſt into the earth, to the depth of about 10 or 15 feet, a leaden tube, whoſe upper extremity may riſe a few inches above the ſurface of the ground; and into this tube you are to paſs the long iron chain or perpendicular rod ſet apart for deſtroying the inſulation, and whoſe upper end is to be hooked to a chain in *H*, fig. 82. or in *k*, fig. 83. Theſe two chains are very ſtrong, and are fit for ſerving as an excellent conductor. Or if you chooſe, you may ſubſtitute in their room weſts of white thread, or iron-wires, which will make no difference in the effects of the apparatus. In the figures we have preferred chains, that the diſtinction of the different parts may be the more ſenſibly perceived. With theſe additions the electro-vegetometer will be as good a thunder-rod as any that are ordinarily conſtructed.

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“ It is not only by means of the electricity in the atmoſphere, collected by the above apparatus, that one can ſupply the electric fluid, which is ſo neceſſary to vegetation; but the electricity named *artificial* anſwers the ſame purpoſe. However aſtoniſhing the idea may be, or however impoſſible it may appear to realize it, yet nothing will be found more eaſy upon trial. Let us ſuppoſe that one wants to augment the vegetation of trees in a garden, orchard, &c. without having recourſe to the apparatus deſtined to pump down as it were the electricity from the atmoſphere, it is ſufficient to have a large inſulating ſtool. This may be made in two ways; either by pouring a ſufficient quantity of pitch and melted wax upon the above ſtool, whoſe borders being more raiſed than its middle, will form a kind of frame; or more ſimply, the ſtool (which is likewiſe called the *inſulator*) ſhall only be compoſed of a plate longer than broad, ſupported by four glaſs-pillars, like thoſe uſed for electrical machines. One muſt take care to place above the inſulator a wooden tray full of water, and to cauſe mount upon the ſtool a man carrying a ſmall pump in the form of a ſyringe. If you eſtabliſh a communication between the man and an electrical machine put in motion (which is eaſily done by means of a chain that connects with the conductor of the machine), then the man thus inſulated (as well as every thing upon the ſtool) will be able, by puſhing forward the ſucker, to water the trees, by pouring upon them an electrical ſhower; and thus diffuſing over all the vegetables under its influence a principle of fecundity that exerts itſelf in an extraordinary manner upon the whole vegetable economy: and this method has moreover this advantage, that at all times and in all places it may be practiſed and applied to all plants whatever.

“ Every one knows that the electricity is communicated to the water thus employed; and it would be eaſy to obtain the moſt ample conviction (if any one doubted it), by receiving upon his face or hand this electrical ſhower; he immediately feels ſmall punctures or ſtrokes, which are the effects of the ſparks that iſſue from each drop of water. This is perceived moſt ſenſibly if there is preſented a metal-diſh to this electrical dew; for at the very inſtant of contact, brilliant flaſhes are produced.

“ That the electricity received by the man from the chain may be communicated to the tray, we muſt put a ſmall cake of white-iron, upon the end of which he may place his foot. The tray filled with water is a kind of magazine or reſervoir to ſerve as a continual ſupply to the pump. After watering one tree, you tranſport the ſtool to a ſecond, a third, and ſo on ſucceſſively; which is done in a ſhort time, and requires very little trouble.

“ Inſtead of the chain, it is better to employ a cord or twiſt of pinchbeck or any other metal; by means of which there can be no loſs of the electric matter, as there is in the caſe of the chain by the ring-points. Moreover, this metal cord or thread being capable of being untwiſted and lengthened, there will be no occaſion of tranſporting ſo often the electrical machine. It is almoſt needleſs to add, that this ſtring or metallic chord, which is always inſulated, may reſt upon the ſame kind of ſupports with thoſe which have been exhibited in *O P* and *s* of fig. 82. and 83. This method is ſimple, efficacious, and nowiſe expenſive, and cannot be too much employed.

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Eaſy method of applying electricity in this manner.

“ If one wants to water either a parterre or common garden-beds and platforms of flowers, or any other plots in which are ſown grain or plants of different ages and kinds, no method is more eaſy and expeditious than the following: Upon a ſmall carriage with two wheels there is placed a framed inſulator in form of a cake of pitch and roſin, as we have mentioned before in fig. 82. The carriage is drawn the whole length of the garden by a man or horſe fixed to it. In proportion as you draw the carriage, the metallic cord winds itſelf upon a bobbin, which turns as uſual. This laſt is inſulated, either becauſe the little apparatus that ſuſtains the bobbin is planted in a maſs of roſin (when you chooſe the axle to be of iron), or elſe becauſe

this

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this moveable axis is a tube of ſolid glaſs. There muſt alſo be a ſupport, which ſerves to prevent the gold-thread or the metallic-cord from trailing on the ground, and thus diſſipating the electricity; and, moreover, it ſerves as an inſulator. To accompliſh this laſt purpoſe, it is neceſſary that the ring into which it paſſes be of glaſs. One may likewiſe employ the inſulators and ſupports marked *OP* and *s*, in fig. 82. and 83. If a gardener, mounted upon an inſulator, holds in one hand a pump full of water, and with the other takes hold of a metallic-cord, in order to tranſmit the electricity which comes from the conductor; in this caſe, the water being electrified, you will have an electrical ſhower; which falling on the whole ſurface of the plants which you want to electrify, will render the vegetation more vigorous and more abundant. A ſecond gardener is to give additional pumps full of water to him who is upon the inſulator, when he ſhall have emptied thoſe he holds; and thus in a little time you will be able to electrify the whole garden. This method takes hardly longer time than the ordinary one; and although it ſhould be a little longer, the great advantages reſulting from it will abundantly recompence the ſmall additional trouble.

"By repeating this operation ſeveral days ſucceſſively, either upon ſeed ſown or plants in a ſtate of growth, you will very ſoon reap the greateſt advantages from it. This operation, equally eaſy with the preceding deſcribed upon the ſubject of watering trees, has been put in practice with the greateſt ſucceſs. Several other methods, anſwering the ſame purpoſe, might be deviſed; but they are all of them pretty ſimilar to that juſt deſcribed.

244
To electrify water kept in reſervoirs, &c.

"I cannot finiſh this article without mentioning another method relative to the preſent object, although it be much leſs efficacious than the preceding ones. It conſiſts in communicating to water kept in baſons, reſervoirs, &c. (for the purpoſe of watering), the electric fluid, by means of a good electrical machine. To this end, one muſt plaſter over with a bituminous cement all the interior ſurface of the baſon deſtined to receive the water that ſerves for irrigation: the nature of this cement anſwering the purpoſe of inſulation, will prevent the electric fluid that communicates with the water from being diſſipated; and the water thus charged with electricity will be the more fitted for vegetation.

"The method juſt now laid down of electrifying water for the purpoſe of watering trees is both eaſy and cheap; the expence of the cement being inconſiderable, as it requires but once to be done, and as it prevents the water from filtrating and being loſt, as well as from hurting the walls themſelves, which would otherwiſe have occaſion to be oftener repaired; conſequently you are ſufficiently indemnified by its utility for all the trouble you take. A machine applied to the extremity of the axle of the electric apparatus might communicate to it a rotatory movement, and ſtill further diminiſh the expence of the operation.

245
Vegetables injured by the electric ſhock.

"If the deficiency of the electric fluid, or rather a ſmall quantity of it, is apt to be hurtful to vegetables, a too great abundance of this matter will likewiſe ſometimes produce pernicious effects. The experiments made by Meſſrs Nairne, Banks, and other learned men of the Royal Society of London, prove ſufficiently this truth. An electric battery, very ſtrong, was diſcharged upon a branch of balſam ſtill holding by its trunk. Some minutes after, there was obſerved a remarkable alteration in the branch, of which the leſs woody parts immediately withered, drooped towards the ground, died next day, and in a ſhort time entirely dried up; at the ſame time that another branch of the ſame plant that had not been put under the electric chain, was not in the ſmalleſt degree affected.

Effect Electi on Ve tion.

"This experiment repeated upon other plants ſhowed the ſame effects; and it was remarked that the attraction, occaſioned by a ſtrong diſcharge of the electricity, produced an alteration different according to the different nature of the plants. Thoſe which are leſs woody, more herbaceous, more aqueous, experience in proportion impreſſions that are ſtronger and much more ſpeedy in their operation.

"A branch of each of the following plants, compoſing an electrical chain, it was obſerved by theſe able philoſophers, that the balſam was affected by the diſcharge of the battery in a few moments after, and periſhed next day. The leaves of a marvel of Peru did not drop till the day following that; and the ſame phenomenon happened to a geranium. Several days elapſed before there was obſerved any fatal effect on the cardinal flower. The branch of a laurel did not ſhow any ſymptoms till after the lapſe of about 15 days, after which it died; but it was a full month before they perceived any ſenſible change on the myrtle; at the ſame time they conſtantly obſerved that the bodies of thoſe plants and branches which had formed no part of the chain, continued to be freſh, vigorous, and covered with leaves in good condition.

24
Blaſti milde poſed owing lightn

"It hardly ever happens that the ſuperabundance of the electric fluid exiſting in a ſmall portion of the atmoſphere where a plant is ſituated, can be ſo great as that which took place by the exploſion of the ſtrong battery of Mr Nairne, directed particularly upon one branch; or if this ſhould happen, it can only be upon a few individual plants in very ſmall number; as when lightning falls upon a tree, breaks it, ſtrips it of its bark, or withers its leaves; or in the caſe of blaſting or mildew in corn, which ſeveral farmers aſcribe to the force of lightning. "This ſentiment (ſays M. du Hamel) has acquired much probability ſince the diſcovery of the great effects of that electricity which is diffuſed ſo abundantly in the atmoſphere when the weather is diſpoſed to be ſtormy." (*Elemens d'Agric.* Tom. I. p. 346.)

"It is not propoſed here to preſcribe the means of remedying the pernicious effects which may be produced upon this occaſion; as there are none of them in circumſtances exactly ſimilar to that of the experiments of the philoſopher juſt now quoted. But although this enormous exceſs of the electric fluid of which we have been ſpeaking, never takes place through any great extent of ſpace, nevertheleſs this exceſs, though even but inconſiderable, may be too great in ſeveral reſpects regarding the vegetable economy; and it is in this caſe that it is proper to ſeek the means of remedying it.

"Let us ſuppoſe that one has ſome plants or ſhrubs, or ects of ctricity Vegeta- n.

or ſome valuable trees or exotics that he wants to preſerve, and is ſenſible that too great a quantity of electricity predominant in the atmoſphere becomes hurtful to them, there are two methods that may ſerve to obviate the evil of which he is apprehenſive. One is, to water plentifully theſe vegetables, ſo that their whole ſurface may be kept ſufficiently wet; the conſequence of which is, that the electricity prevailing in the atmoſphere will be tranſmitted to the earth by the water adhering to the outſide of the plants, as it is well known that water is an excellent conductor of the electric fluid: The other is, to place near theſe trees metallic points, which may be eaſily accompliſhed by ſimple lathes or wooden-poles; along which one muſt faſten by bandages plain iron-wires, ſo as to overtop them by ſome inches. Theſe poles thus prepared, being thruſt into the earth, will then draw down the electric fluid, and tranſmit it to the earth."

247 thods of roying cts by tricity.

Our author now proceeds to conſider of methods of deſtroying the inſects which frequently infeſt and deſtroy vegetables; which, he thinks, may be obtained by means of the electric fluid.

"Experience (ſays he) proves, that in years when vegetation is moſt vigorous and abundant, inſects, if nothing oppoſes them, will then be moſt multiplied; and in fact they are ſometimes ſo to an aſtoniſhing degree. How great miſchief they produce on theſe occaſions, every body knows, and as ardently deſires to find a remedy for the calamity. The damage is indeed ſo conſiderable, that people imagine it is not poſſible by any means to put a ſtop to it; but I am of opinion, it is one of thoſe evils to which electricity may be applied with effect.

248 chief e by ca- illars ing in- ne heart wigs.

"It has been often remarked, that ſeveral ſpecies of worms or caterpillars are found in the heart of ſhoots, twigs, and even the trunks of trees, of ſhrubs, and of plants of different ſorts. There are numbers, for example, in pear and other fruit trees. As ſoon as the animal has got to the inſide of a branch, he forms a gallery according to the length of it: armed with ſtrong ſcaly jaws, he ſoon reduces the woody ſubſtance to powder; and this ſame delicate caterpillar makes the wood, hard as it is, his favourite nouriſhment. Other inſects generally ſhow themſelves in open day: but this one, like a pioneer, marches always in obſcurity within; and we are appriſed of his preſence only by the miſchief he produces, namely, by obſerving the tops of branches to wither, the leaves to fade and incline to the earth, and in fine the whole infected bough to decay and die away. In vain do you ſeek for this frail though terrible animal on the leaves; he enters the ſkin and penetrates the thickeſt bark of the ſurface; he goes even to the heart of the woody ſubſtance; and you can extirpate him only by cutting off the wood; and if this is a remedy, you muſt confeſs that it is at leaſt equal to the miſchief.

"This evil ſo much the more merits attention, that it extends itſelf particularly over a very great number of fruit-trees; in which, for the ſame reaſon, we are as particularly intereſted. Electricity, however, furniſhes us with a remedy of the moſt efficacious ſort to ſtop the progreſs of the evil, by attacking the enemy in his quarters, and deſtroying him in his own mine; which in this event is to become his tomb.

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249 Eaſily killed by an electric ſhock.

"The Leyden phial, by the mere force of its ſhock, which can be augmented gradually, is capable of deſtroying not only rabbits and pigeons, but bulls and oxen, eſpecially when we employ electrical batteries of great ſize, and containing a great number of electrified jars. Of conſequence then it may be employed even with little apparatus to kill a tender and delicate caterpillar, which, in order to ſhelter itſelf from the impreſſions of the air, is obliged to keep perpetually ſhut up in the heart of trees, or in that of twigs, branches, or trunks themſelves.

"In order to ſucceed in killing theſe animals at the time when they begin to ſhow their ravages, which mark likewiſe the place where the caterpillar is concealed, it is ſufficient to make an electric chain with two plain iron-wires, and to place betwixt the two that part of the tree where it is ſuppoſed the inſect reſides. One need not be afraid of taking in even a larger ſpace, for the experiment will ſucceed as well in a great extent as in a ſmall; and beſides, one runs no riſk of miſſing the enemy he wants to combat. Let us ſuppoſe, that one be aſſured from the forementioned ſymptoms, that there is an inſect in the tree; in this caſe you place iron-wires above and below the place where you ſuſpect it to be lodged. Next, you muſt take care to make the one communicate with the exterior ſurface of an ordinary jar charged with electricity, and the other with the interior ſurface, which it is eaſy to do by bending theſe iron-wires ſo as to make them approach the electrical jar; then upon diſcharging this veſſel where the electric fluid ſuperabounds, the exploſion is made to traverſe the part where the animal lodges: the violence of the ſhock makes him die without recovery, and ſo deſtroys the evil in its ſource. If the ravage has not been carried to a high pitch, the tree recovers very ſoon, as I have often obſerved: but whatever be the reſult as to the re-eſtabliſhment in certain circumſtances, the evil proceeds no further; its progreſs ſtops; and it is always a great advantage to have arreſted it in its march.

"Several experiments have convinced me of the ſucceſs of this method. Upon cutting off ſeveral branches on which I diſcharged my jar or Leyden bottle, I conſtantly obſerved the animal dead; and you never fail of killing it when the diſtance betwixt the two extremities of the iron-wires is not too great, and when you take care to approach or remove them ſucceſſively by repeating the ſhock ſeveral times.

"The bottle here employed cannot hurt the vegetable economy, becauſe its dimenſions are not too great, and no batteries are brought in play. The electric ſhock, given in certain bounds, is uſeful to animals; it therefore cannot be noxious to plants in the ſame circumſtances.

250 How to perform the operation on a great number of trees at once.

"This operation is not tedious even when employed upon a great number of trees; but if one wants ſtill further to abridge it, I here give him a method by which the experiment can be made in the ſame inſtant upon all the trees of an orchard, and will not be more tedious than if it were employed upon one tree only. You have only to provide a ſufficient number of iron-wires, and to diſpoſe them as was done for the firſt tree we ſpoke of juſt now, and in the ſame manner; by which means all theſe trees form an electrical

trical chain, and the fluid in the exploſion of the bottle will run over through the whole, ſuppoſing that you have diſcharged the bottle in the ordinary way, and at the ſame time taken care of what is very eſſential, that while the free extremity of the firſt wire touches the exterior ſurface of the electrical jar, the end of the other may communicate with the inſide of the ſame charged phial.

251 How to deſtroy a caterpillar in the root of a tree.

“If the caterpillar be in the root, the operation is pretty much the ſame. By taking away, for an inſtant, a little earth, you eaſily put the affected roots within the chain: but if one is ignorant of the particular ramification of the root which is attacked, without uncovering the tree, you need only inſert in the earth two wires oppoſite in their directions, and then perform the Leyden experiment, which is eaſily done. After having placed theſe two wires north and ſouth, you may repeat the experiment by placing them eaſt and weſt. You can hardly then miſs the inſect, eſpecially if, in order to take in more ſpace, you inſert one of the wires farther than the other: for in this caſe the electric fluid will deſcribe a diagonal, as we have already ſhown in regard to branches.

252 To prevent theſe animals from generating in plants.

“This method ſerves not only to prevent the progreſs of the evil, but in ſome ſenſe to anticipate it. In regard to theſe deſtructive inſects there are epochs as for plants; both of them have marked times for their birth, their developement, their growth, their multiplication, and that relative both to their genera and ſpecies. When the time is come that inſects, caterpillars, and other animals attack plants, one muſt employ, by way of precaution, the method we have juſt now laid down; and by repeating the ſame from day to day for a certain ſpace of time, we will at laſt ſucceed in preſerving trees from the ravages of inſects. The operation is neither tedious nor expenſive; why then not have recourſe to it for thoſe curious and rare trees which come from afar at a great expence, and thoſe valuable other trees that yield us yearly the moſt delicious fruits?

253 Advantages to be expected from this method.

“The method juſt mentioned is the moſt effectual that can be imagined, ſince it purſues the enemy to his moſt concealed corners in the inmoſt texture of the wood, and is capable of killing him in the very heart of trees, under the bark when he is to be found there, in the branches, and in the heart of the roots themſelves: all which we have made appear in the foregoing remarks. I may further add, that there is no other remedy known but by electricity; for how is it poſſible to find out under the bark of a tree one or more inſects that gnaw and deſtroy it? Muſt we not in this caſe ſtrip the mentirely of their bark? and would not, therefore, the remedy be often worſe than the diſeaſe? Beſides, by what means could we penetrate into the heart of the tree? Would not the inſtrument employed to cut and lop it, rather add to the miſchief, eſpecially in the beginning of its progreſs? How again could we rummage to the inſide of the roots? The tree thus uncovered, would it not ſuffer, eſpecially in the great heats, when a perſpiration more abundant muſt render neceſſary a nouriſhment, whoſe quantity ought at all times to be equal at leaſt to the waſte? Thus the celebrated Linnæus, ſtruck with the calamities which fruit-trees in particular ſuffer from inſects and their caterpillars, cried out: “Who ſhall deliver us from this ſcourge?” *Quis poſſit liberare arbores fructiferas a larvis?*”

On this ſubject we cannot help obſerving, that there is ſome reaſon to ſuppoſe that the Abbe has over-rated the power of his remedy with regard to the deſtruction of inſects. There is not the leaſt doubt that an inſect will be deſtroyed by finding a ſhock of electricity through its body; but while this inſect is defended by the vegetable which it has pierced, and in which it lodges, the vegetable will alſo receive a very conſiderable part; and thus the inſect may ſtill eſcape, unleſs the ſhock be augmented to ſuch a degree as to injure the vegetable alſo. His other experiments, it is ſaid, have been confirmed by the obſervations of modern electricians.

## SECT. XII. *Effects of Electricity on Animals; of the Gymnotus, Torpedo, and other Electric Fiſhes; Medical Electricity.*

Soon after the diſcovery of the electrical ſhock, and the method of augmenting the power of electricity, it naturally became an object with philoſophers to inveſtigate the effects of it upon animal bodies. Theſe were quickly found to be entirely ſimilar to ſuch as are produced upon any other conducting ſubſtances, viz. an emiſſion of ſparks, attraction, and repulſion, &c. By degrees it was found, that very ſtrong ſigns of electricity were exhibited by ſome animals, even without the application of any artificial apparatus. The experiment of producing ſparks by ſtroking the back of a cat in froſty weather, readily ſhowed that the electric fluid may exiſt in a very active ſtate in the body of an animal without injuring any of its functions. From animals of the inferior kind a tranſition was made to the human ſpecies; and ſigns of electricity were diſcovered in them where it had not been ſuſpected before. Some people have been remarkable for an extreme luſtre of their eyes; and others have been ſo much electrified naturally, as to give evident ſigns of it when a ſenſible electrometer had been applied to them. Others have manifeſted an extreme ſenſibility of even the ſmalleſt degrees of electricity, inſomuch that they would be affected by a flaſh of lightning, though ſo remote that the thunder could not be heard. All this ſhowed that the ſubtile fluid we treat of bears a very active part in the animal economy, and led to more important reſearches on the ſubject. One of the firſt diſcoveries was, that ſome creatures are ſo ſtrongly electrified naturally as to have it in their power to give a ſtrong ſhock at pleaſure, capable of deſtroying any ſmall animal that comes near them. Of theſe, however, only three, and thoſe of the aquatic kind, have yet been obſerved, viz. the gymnotus electricus, the torpedo, and another called the *ſilurus electricus*.

25 Some mals n rally e trified.

The gymnotus* hath the aſtoniſhing property of giving the electric ſhock to any perſon, or number of perſons, either by the immediate touch with the hand, or by the mediation of any metallic conductor; and a perſon who kept ſome of them told Dr Garden, that they had this property much ſtronger when firſt catched than afterwards.

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* See article *Gymn*

55 tical erties e gym- s.

wards. "The perſon (ſays he) who is to receive the ſhock, muſt take the fiſh with both hands, at ſome conſiderable diſtance aſunder, ſo as to form the communication, otherwiſe he will not receive it, at leaſt I never ſaw any one ſhocked from taking hold of it with one hand only; though ſome have aſſured me, that they were ſhocked by laying one hand on it. I myſelf have taken hold of the largeſt with one hand often without ever receiving a ſhock; but I never touched it with both hands, at a little diſtance aſunder, without feeling a ſmart ſhock. I have often remarked, that when it is taken hold of with one hand, and the other is put into the water over its body without touching it, the perſon received a ſmart ſhock; and I have obſerved the ſame effect follow when a number joined hands, the perſon at one extremity of the circle taking hold of or touching the fiſh, and the perſon at the other extremity putting his hand into the water over the body of the fiſh. The ſhock was communicated through the whole circle as ſmartly as if both the extreme perſons had touched the fiſh. In this it ſeems to differ widely from the torpedo, or elſe we are much miſinformed of the manner in which the benumbing effect of that fiſh is communicated. The ſhock which the gymnotus gives ſeems to be wholly electrical; and all the phenomena or properties of it exactly reſemble thoſe of the electric *aura* of our atmoſphere when collected, as far as they are diſcoverable from the ſeveral trials made on this fiſh. This ſtroke is communicated by the ſame conductors, and intercepted by the interpoſition of the ſame original electrics, or electrics *per ſe* as they uſed to be called. The keeper of this fiſh informs me, that he catched them in Surinam river, a great way up, beyond where the ſalt-water reaches; and that they are a freſh-water fiſh only. He ſays, that they are eaten, and by ſome people eſteemed a great delicacy. They live on fiſh, worms, or any animal-food if it is cut ſmall ſo that they can ſwallow it. When ſmall fiſhes are thrown into the water, they firſt give them a ſhock, which kills or ſo ſtupifies them, that they can ſwallow them eaſily and without any trouble. If one of theſe ſmall fiſhes, after it is ſhocked, and to all appearance dead, be taken out of the veſſel where the electrical fiſh is, and put into freſh water, it will ſoon revive again. If a larger fiſh than they can ſwallow be thrown into the water, at a time that they are hungry, they give him ſome ſmart ſhocks till he is apparently dead, and then they try to ſwallow or ſuck him in; but, after ſeveral attempts, finding he is too large, they quit him. Upon the moſt careful inſpection of ſuch fiſh, I could never ſee any mark of teeth, or the leaſt wound or ſcratch on them. When the electrical fiſh are hungry, they are pretty keen after their food; but they are ſoon ſatiſfied, not being able to contain much at one time. An electrical fiſh of three feet and upwards in length cannot ſwallow a ſmall fiſh above three or at moſt three inches and a half long. I am told, that ſome of theſe have been ſeen in Surinam river upwards of 22 feet long, whoſe ſtroke or ſhock proved inſtant death to any perſon that unluckily received it."

256 ne very ge ones nd in inam r.

Several other accounts of this fiſh have been publiſhed by different perſons, but none of them ſo full and diſtinct as the above. They all agree that the electric virtue of the fiſh is very ſtrong. Mr Fermin, in his natural hiſtory of Surinam, publiſhed in 1765, tells us, that one cannot touch it with the hands, or even with a ſtick, without feeling a horrible numbneſs in the arms up to the ſhoulders; and he farther relates, that, making 14 perſons graſp each other by the hands, while he graſped the hand of the laſt with one of his, and with the other touched the eel with a ſtick, the whole number felt ſo violent a ſhock, that he could not prevail on them to repeat the experiment. V. Vanderlott, in two letters from Rio Eſſequebo, dated in 1761, makes two ſpecies, the black and the reddiſh; though he acknowledges, that, excepting the difference of colour and degree of ſtrength, they are not materially different. In moſt experiments with theſe animals, he remarked a ſurpriſing reſemblance between them and an electrical apparatus: nay, he obſerved, that the ſhock could be given to the finger of a perſon held at ſome diſtance from the bubble of air formed by the fiſh when he comes to the ſurface of the water to breathe; and he concluded, that at ſuch times the electrical matter was diſcharged from his lungs. He mentions another characterizing circumſtance, which is, that though metals in general were conductors of its electric property, yet ſome were found to be ſenſibly better than others for that purpoſe. Of this property Dr Prieſtley takes notice, and ſays, that a gold ring is preferable to any thing elſe. The ſame is likewiſe obſerved by Linnæus. Dr Prieſtley adds, that the ſenſation is ſtrongeſt when the fiſh is in motion, and is tranſmitted to a great diſtance; ſo that if perſons in a ſhip happen to dip their fingers or feet in the ſea, when the fiſh is ſwimming at the diſtance of 15 feet from them, they are affected by it. He alſo tells us, that the gymnotus itſelf, notwithſtanding all its electric powers, is killed by the lobſter.

257 Remarkable difference of the conducting power of metals with regard to this ſhock.

258 Of the torpedo.

The ſurpriſing property of the torpedo* in giving a violent ſhock to the perſon who takes it in his hands, or who treads upon it, was long an object of wonder. For ſome time it was in general reckoned to be entirely fabulous; but at laſt the matter of fact being aſcertained beyond a doubt, philoſophers endeavoured to find out the cauſe. M. Reaumur reſolved it into the action of a vaſt number of minute muſcles, which by their accumulated force gave a ſudden and violent ſtroke to the perſon who touched it. But ſolutions of this kind were quite unſatiſfactory, becauſe the ſtroke was found to be communicated through water, iron, wood, &c. When the phenomena of electricity began to be better known, it was then ſuſpected that the ſhock of the torpedo was occaſioned by a certain action of the electric fluid; but as not the leaſt ſpark of fire, or noiſe, could ever be perceived, this too ſeemed inſufficient. Of late, however, Mr Walſh has with indefatigable pains, not only explained this ſurpriſing phenomenon on the known principles of electricity, but given a demonſtration of his being in the right, by conſtructing an artificial torpedo, by which a ſhock reſembling that of the natural one can be given.

259 Artificial one made by Mr Walſh.

The electric organs of the torpedo conſiſt of two ſets of very ſmall cylinders lying under the ſkin, one of which is electrified poſitively and the other negatively,

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* For its natural hiſtory, ſee the article *Raja*, of which the torpedo is a ſpecies.

Effects on Animals.

tively, ſeemingly at the pleaſure of the fiſh. When a communication is made between the ſet of cylinders poſitively electrified and thoſe which are negatively ſo, a diſcharge and ſhock enſue, like what happens in the caſe of the Leyden phial. The only difficulty now is to account for the total abſence of a ſpark (which in the caſe of the torpedo never exiſts even in the ſmalleſt degree), and the impoſſibility of conducting the ſhock through the ſmalleſt interval of air. But this alſo is explained in a ſatisfactory manner by Mr Walſh, and ſhown to be nothing elſe than what every day takes place in our electrical experiments. It is well known, that a ſmall charge of electricity, if put into a little phial, will occaſion a bright ſpark and loud noiſe when diſcharged: but if the ſame charge is put into a phial much larger, the ſpark and noiſe will be leſs in proportion; neither will the ſpark break through near ſuch a ſpace of air in the latter caſe as in the former; though the ſhock would in both caſes be the ſame to a perſon who received it through his body. If, inſtead of a large phial, we ſuppoſe the charge to be diffuſed all over a large battery, the ſhock would ſtill be the ſame, and yet the ſpark and noiſe attending it would be almoſt imperceptible. The caſe is juſt the ſame with the torpedo. Each of the electric organs is a battery compoſed of innumerable ſmall cylinders, which diſcharging themſelves all at once produce a formidable ſhock; but by reaſon of the ſmallneſs of the charge of each, the ſpark is imperceptible, and cannot break through the leaſt ſpace of air. The truth of this was exemplified in Mr Walſh's artificial torpedo, which though it would give a very conſiderable ſhock through a conductor totally uninterrupted, yet on the leaſt breach therein, even for the breadth of a hair, no ſhock was felt.

260 Why no ſpark is diſcovered in the ſhock given by the torpedo.

In every other reſpect the electricity of the torpedo agrees with that exhibited by the common electrical machines. An inſulated perſon cannot receive a ſhock by touching one of the electric organs of the fiſh; but a violent ſtroke is given to the perſon, whether inſulated or not, who lays one hand on the poſitive and the other on the negative organ. The fiſh, as is reaſonable to imagine, ſeems to have this electric property in its own power; and appears ſenſible of his giving the ſhock, which is accompanied by a kind of winking of his eyes.

261 Of the ſilurus electricus.

The third fiſh which is known to have the power of giving the ſhock, is found in the rivers of Africa, but we have a very imperfect account of its properties (o). This animal belongs to the order called in Willoughby's ſyſtem *ſilurus*; hence it is commonly called *ſilurus electricus*. Some of thoſe fiſhes have been ſeen even above 20 inches long. The body of the ſilurus electricus is oblong, ſmooth, and without ſcales; being rather large, and flattened towards its anterior part. The eyes are of a middle ſize, and are covered by the ſkin which envelopes the whole head. Each jaw is armed with a great number of ſmall teeth. About the mouth it has ſix filamentous appendices, viz. four from the under lip and two from the upper; the two external ones, or farthermoſt from the mouth on the under lip, are the longeſt. The colour of the body is greyiſh, and towards the tail it has ſome blackiſh ſpots. The electric organ ſeems to be towards the tail, where the ſkin is thicker than on the reſt of the body; and a whitiſh fibrous ſubſtance, which is probably the electric organ, has been diſtinguiſhed under it. It is ſaid that the ſilurus electricus has the property of giving a ſhock or benumbing ſenſation like the torpedo, and that this ſhock is communicated through ſubſtances that are conductors of electricity; but no other particular about it is known with any conſiderable degree of certainty.

An inquiſitive mind will immediately aſk, for what purpoſe has nature furniſhed thoſe animals with ſo ſingular a property? But the preſent knowledge of the ſubject ſeems to furniſh no other anſwer, except that they are endowed with the power of giving the ſhock for the ſake of ſecuring their prey, by which they muſt ſubſiſt, and perhaps of repelling larger animals which might otherwiſe annoy them.

The ancients conſidered the ſhocks given by the torpedo as capable of curing various diſorders; and a modern philoſopher will hardly heſitate to believe their aſſertions, after that electricity has been found to be a remedy for many diſeaſes.

Beſides theſe animals which manifeſt their electric power evidently by giving a ſtrong ſhock, there are others in which the fluid ſeems to act by the emiſſion of light. This indeed has not been proved by actual experiment, tho' it would certainly be well worth while to try whether by inſulating a number of them, any more evident ſigns of electricity could be obtained. Theſe creatures are of the inſect tribe; ſome of them furniſhed with wings, as the ſhining flies in the warm countries; while others, as the glow-worm, crawl perpetually on the earth. It is moſt probable alſo, that the ſparkling of ſea-water is owing to the electricity of the inſects which occaſion it. Be this as it will, however, from the inſtances already adduced, it is certain that the electric fluid pervades at all times the whole body of every animal; whence, by exciting or diminiſhing its action, it is reaſonable to ſuppoſe that many important changes might be made in the human body, and hence the foundation of *Medical Electricity*.

Though the effects of this fluid as a remedy for diſeaſes fall particularly to be mentioned under the article MEDICINE, we cannot help here taking notice, that a very ſtrange uncertainty remains concerning what we ſhould imagine to be its firſt and moſt obvious effects; namely, whether ſimple electrification has any effect in quickening and augmenting the pulſe? This was ſaid to be the caſe by the firſt electricians, but denied by their ſucceſſors; and even when the great machine at Haarlem is made uſe of, it ſtill remains doubtful whether there be any effect of this kind or not.

The ſhock of the Leyden phial having been found effectual in removing ſome complaints, the uſe of it was introduced into the common practice of medicine; and is ſtill continued, though a more gentle method of uſing the fluid is now generally preferred. The apparatus for the medical electrician, beſides the machine already deſcribed, conſiſts of the following parts. 1. An

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(o) Meſſrs Adanſon and Forſkal make a ſhort mention of it, and M. Brouſſonet deſcribes it under the French name of *le Trembleur* in the Hiſt. de l'Academie Royale des Sciences for the year 1782.

inſulating ſtool with glaſs feet, or, what is much better, an arm chair, well rounded at the edges of the wooden parts, and fixed on a large ſtool with glaſs feet, which ſhould be at leaſt nine or ten inches in length; for the longer the feet are, the better will the inſulation be. The inſide part of the back of the chair ſhould move on an hinge, that it may occaſionally be let down to the ſtool, and ſo the back of the patient be electrified more conveniently; the arms of the chair ſhould be made longer than ordinary. 2. A Leyden bottle with a diſcharging electrometer. 3. A pair of directors of conſiderable ſize, with glaſs handles and wooden points. 4. A large metallic ball of braſs or copper, with a metallic handle to receive the ſparks. The ball ſhould be unſcrewed, and the wire long and ſharp pointed to receive the ſtream of electric fire. 5. A few glaſs tubes of different bores, ſome of them with capillary points. 6. Several yards of braſs wire or chain; or, which is much better, ſeveral lengths of wires with loops at the end; the part of the wire between theſe being covered with ſome non-conducting ſubſtance, as a ſilk ribbon, &c.

V.

The directors are repreſented by fig. 29. the handles being of glaſs, one of them having a ball on its end repreſented by *A*; the other is without the ball, having its wire bent for the conveniency of conducting the electric ſtream on the eye, &c. Either of the balls may be unſcrewed from the wires, and the wooden point *B* ſcrewed in its place, or the pointed end of the braſs wire uſed. The glaſs handles ſhould be held as far from the braſs work as poſſible. To convey the electric fluid to the ear or throat, glaſs tubes with ſliding braſs wires through them ſhould be made uſe of, ſuch as are repreſented in fig. 30.

Fig. 31, 32. repreſent the electric forceps, which is thought by ſome electricians to be more convenient for giving the ſhock than the directors. Fig. 33. is the medical jar, with an electrometer, that regulates the ſtrength of the ſhock, and enables the operator to give a ſucceſſion of them of nearly equal force. On the upper part of a bent piece of glaſs *C* is cemented a braſs ſocket *D*, which is faſtened to a ſpring tube *E*; a wire *F* moves in this tube, ſo that the ball *G* may be ſet at any required diſtance from the ball *H*. The end *I* of the bent piece of glaſs is alſo cemented to a ſpring tube, which ſlides upon the wire *K*, communicating with the inſide of the jar.

ock ti- rt ody

To uſe this medical jar, the ball *H* muſt be placed in contact with the conductor of the electrical machine, or at leaſt be connected with it by a wire; after which it is to be charged in the uſual manner. If a wire proceeds from the ball *L* to the outſide coating, the jar will be immediately diſcharged, as the accumulation of the electric fluid is ſufficiently powerful to paſs through the ſpace of air between the two balls: hence a ſhock may be communicated to the arm by means of the wires and directors as in the figure, and it will be ſtronger in proportion as the diſtance of the ball *G* from *H* is augmented. This electrometer acts in the manner of the common diſcharging rod, and therefore has received the name of the *diſcharging electrometer*.

III.

In fig. 6. we have a repreſentation of Mr Lane's electrometer applied to the machine for medical electricity. *G*, the lower part of which is incloſed in the pillar *F*, is made of wood baked and boiled in linſeed-oil, and bored cylindrically for two-thirds of its length. The braſs work is fixed to the pillar by the ſcrew *H*, and is moveable in the groove *I*, ſo that it may be raiſed higher or lower as the height of the jar *D* requires. A ſteel ſcrew *L* paſſes through the braſs work, having its threads about $\frac{1}{12}$th of an inch diſtant from one another. To the end of this, and oppoſite to *K*, is fixed a hemiſpherical and well poliſhed piece of braſs; and a braſs ball *M*, likewiſe well poliſhed, is fixed to the prime conductor. To this ſcrew is annexed a circular plate *O*, divided into 12 equal parts; and in every revolution of this ſcrew pointing to the diviſions of the ſcale *N*, each of which are equal to one turn of the ſcrew. The uſe of this electrometer is to diſcharge the jar *D*, or any battery connected with the prime conductor, when the machine is not applied to medical purpoſes. If a perſon holds a wire faſtened to the ſcrew *H* in one hand, and another wire (fixed to *E* by a loop of braſs) paſſing from the frame of the machine to a tin-plate on which the jar *D* ſtands, or the hook *E* connected with it, he will perceive no ſhock when *K* and *M* are in contact; and the degree of exploſion, as well as the quantity of electricity accumulated in the jar, will be regulated by the diſtance of *K* and *M* from each other.

The improved way of applying the diſcharging electrometer to the conductor, is found to be much more convenient and ready than any other; as it has alſo the advantage of being uſeful to a jar or battery of any ſize. See fig. 6. where *a A* repreſents the electrometer as applied to the conductor; *c d* the improved medical jar ſuſpended at a ſmall diſtance from it. A ſmall glaſs tube *e f* is fixed in this jar, a part of the lower end of which is coated. Two wires paſs through the braſs ball *C* on the top of this tube; one of which is connected with the bottom of the jar, and the other goes only to the internal coating of the ſmall tube. The wires are moveable at pleaſure, and the jar is ſuſpended from the conductor by a braſs ring; and a chain or wire muſt be fixed to the hook *d* at the bottom. From a bare inſpection of the figure, it appears that the arm will receive the ſhock by the diſcharge of the jar *a c d*: for, by turning the cylinder round, the jar ſoon becomes charged either with one or both wires in it; and directly as the charge becomes ſufficiently ſtrong to paſs thro' the air, it will explode, and the fluid paſs to the end of *b* next to it, going through the wire to the wriſt, and from thence up to the other chain at the ſhoulder. By reverſing the poſitions or the connections of the two wires, the progreſs of the ſhocks will be reverſed, *viz.* from the ſhoulder to the wriſt. If the ſhort wire alone be left in the jar *c d*, and the diſcharging ball of the electrometer *a b c* be placed from a quarter of an inch to a whole one from the conductor, a moſt delicate ſmall ſhock may be given, and repeated any number of times at pleaſure. This is called the *electrical vibrating ſhock*.

Plate CLXXV.

Fig. 31. *g* repreſents the bottle director. It is hollow, and coated like a common jar, acting as ſuch, and in ſome caſes is looked upon as convenient. With this, as with the common director, it is proper to preſs the ends againſt the part where the ſhock is to be applied.

P CLXXVI.
266 Pocket electrical apparatus.

Fig 56. repreſents a ſmall pocket electrical apparatus, which may ſometimes be of uſe for medical purpoſes as well as others. It is packed up in a very ſmall ſize, being only five inches long, two broad, and one deep. It is capable of a tolerable ſtrong charge or accumulation of electricity, and will give a ſmall ſhock to one, two, three, or a greater number of perſons.

*A* is the Leyden phial or jar that holds the charge; *B* is the diſcharger to diſcharge the jar when required without electrifying the perſon that holds it; *C* is a ſilk ribbon prepared by a coating of varniſh, ſo as to be excited, and communicate its electricity to the jar; *D* are two hair, &c. ſkin rubbers, which are to be placed on the firſt and middle fingers of the left hand, and ſerve to excite the ribbon *C*.

*To charge the jar.* Place the two finger-caps *D* on the firſt and middle finger of the left hand; hold the jar *A* at the ſame time at the joining of the red and black *E* on the outſide between the thumb and firſt finger of the ſame hand; then take the ribbon in your right hand, and ſteadily and gently draw it upwards between the two rubbers *D*, on the two fingers, taking care at the ſame time the braſs ball of the jar is kept nearly cloſe to the ribbon while it is paſſing through the fingers. By repeating this operation 12 or 14 times the electrical fire will paſs into the jar, which will become charged; and by placing the diſcharger *C* againſt it, as in the plate, you will ſee a ſenſible ſpark paſs from the ball of the jar to that of the diſcharger. If the apparatus is dry and in good order, you will hear the crackling of the fire when the ribbon is paſſing through the fingers, and the jar will diſcharge at ſome diſtance.

*To electrify a perſon.* You muſt deſire him to take the jar in one hand, and with the other touch the knob of it: or, if diverſion is intended, deſire the perſon to ſmell at the knob *A* of it, in expectation of ſmelling the ſcent of a roſe or a pink: this laſt mode has occaſioned it to be ſometimes called the *magic ſmelling bottle.*

The following are the principal methods by which electricity may be applied to the human body with a medical view.

267 Various methods of applying electricity.

1. *By merely placing the patient in an inſulated chair, and connecting him with the prime conductor.*—When the machine is in action, he will thus be filled with the electric fluid, which will be continually diſſipated from the points and edges of his clothes: and though the effects of this are probably too ſlow to be rendered very advantageous, yet a ſedentary perſon might perhaps derive ſome benefit from ſitting in an inſulated chair, having before him an inſulated table, the chair to be connected with the ball of a large charged jar or battery; by which means a ſmall quantity of the fluid will be continually paſſing through thoſe innumerable capillary veſſels, on the right ſtate of which our health ſo much depends.

2. *By throwing the fluid upon, or extracting it from a patient, by means of a wooden point.*—This may be effected in a twofold manner: 1*ſt*, By inſulating the patient, and connecting him either with the cuſhion or the poſitive prime conductor, the operator preſenting the point. 2*d*, Let the patient ſtand upon the ground, and the wire of the director be connected either with the poſitive or negative parts of the machine. The ſenſation produced by the fluid when acting in this manner is mild and pleaſing, reſembling the ſoft breezes of a gentle wind; generating a genial warmth, and promoting the ſecretion and diſſipation of tumors, inflammations, &c.

3. *By the electric friction.*—Cover the part to be rubbed with woollen cloth or flannel. The patient may be ſeated in an inſulated chair, and rubbed with the ball of a director that is in contact with the conductor; or he may be connected with the conductor, and rubbed with a braſs ball which communicates with the ground. The friction thus produced is evidently more penetrating, more active, and more powerful, than that which is communicated by the fleſh bruſh; and there is very little fear of being thought too ſanguine. This, when uſed but for a few minutes, will be found more efficacious than the other after ſeveral hours application.—Electricity applies here with peculiar propriety to ſpaſm, pleuriſy, and ſome ſtages of the palſy; and in every caſe anſwers the end of bliſtering where the diſcharge is not wanted, being the moſt ſafe and powerful ſtimulant we know.

4. *By taking ſtrong ſparks from the patient.* Here, as in every other caſe, the operator may connect the ball of the director with the poſitive or negative conductor, or he may connect the patient with either of theſe and the ball with the ground. Now it is clear from what has been already laid down, that if the director be connected with the poſitive conductor, the fluid is thrown upon the patient, if with the cuſhion the fluid is extracted from him. Let the patient be inſulated, and the action is in ſome meaſure reverſed; if he is joined to the negative conductor or cuſhion, he will receive a ſpark from a perſon ſtanding on the floor; but if he communicates with the poſitive conductor, he will give the ſpark to the perſon on the ground.

5. *By cauſing a current of the electric fluid to paſs from one part of the body, and thus confining and concentrating its operation without communicating the ſhock.* Place the patient in an inſulated chair, and touch one part of the body with a director, joined to a poſitive conductor; then with a braſs-ball communicating with the ground touch another part; and when the machine is in action the fluid will paſs through the required part from the conductor to the ball; the force of the ſtream will be different according to the ſtrength of the machine, &c. Or connect one director with the cuſhion and the other with the poſitive conductor, and apply theſe to the part through which the fluid is to paſs, and when the machine is in action the electricity will paſs from one ball to the other. It is not neceſſary to inſulate the patient in this caſe.

6. *By the ſhock.* Which may be given to any part of the human body, by introducing that part of the body into the circuit which is made between the outſide and inſide of the bottle. This is conveniently effected, by connecting one director by a piece of wire with the electrometer and the other with the outſide of the bottle; then hold the directors by their glaſs-handles, and apply the balls of them to the extremity of the parts through which the ſhocks are to be paſſed. The force of the ſhock, as we have already obſerved, is augmented or diminiſhed by increaſing or leſſening the diſtance between

between the two balls, which muſt be regulated by the operator to the ſtrength and ſenſibility of the patient. Inſtead of the common bottle, we may have a ſmall one with a glaſs tube proceeding from it, through which proceeds a wire and hook to hang it upon the machine, with a longer one from the outſide coating, and which is to be carried by means of a director to the patient. When this is uſed as a common bottle, both wires are to be left there, and the ſhock is communicated by two directors, one connected with the bottom, the other with the top. The operator will often find himſelf embarraſſed in giving ſmall ſhocks, the fluid paſſing from the conductor to the ball of the electrometer, inſtead of going through the circuits he deſires: when this happens, which may be known by the chattering noiſe of the ſpark, the reſiſtance formed to the diſcharge is ſo great, that the fluid cannot force its way through the circuit: to remedy this, paſs two metallic pins through the cloathing, ſo that they may be in contact with the ſkin, which will leſſen the reſiſtance and conduct the fluid.

7. *By a ſenſation between a ſhock and the ſpark, which does not communicate that diſagreeable feeling attending the common ſhock.* This is effected by taking out the long wire from the ſmall medical bottle, and leaving the ſhorter one which is connected with the tube in its place, the directors to be connected and uſed as before. The effect of this ſpecies of ſhock, if it may be called one, is to produce a great vibration in the muſcular fibres, without inducing that pungent ſenſation which the ſhock effects. It is therefore applicable to ſome ſtages of palſy and rheumatiſm; it may alſo ſerve as an artificial means of exerciſe.

8. *By the bottle-director.* Inſulate the patient, and place one of the balls in contact with him; by which means this director is charged. Now if a wire is conveyed from the bottom of this to the top of another director, the bottle-director will be diſcharged whenever the other ball *h* is brought in contact with the patient; ſo that by bringing it down with rapidity, any number of ſmall ſhocks may be procured in a minute: or connect the inſulated patient with the top or inſide of a large charged jar, and then this apparatus uſed in the foregoing manner will diſcharge from the large jar at each ſpark its own contents, and by repetition diſcharge the whole jar: thus a number of ſhocks may be given without continually turning the machine or employing an aſſiſtant.

9. *By paſſing the whole fluid contained in the Leyden phial through a diſeaſed part without giving the ſhock.* Connect a director, by means of a wire, with the ball of a Leyden jar; charge the jar either completely or partially, and then apply the ball or point of the conductor to the part intended to be electrified, and the fluid which was condenſed in the phial will be thrown on the part in a denſe ſlow ſtream, attended with a pungent ſenſation which produces a conſiderable degree of warmth. If a wire that communicates with the ground is placed oppoſite to the end of the director, the paſſage of the fluid will be rendered more rapid, and the ſenſation ſtronger. Or inſulate the patient, connect him with the top of a jar, charge this, and then apply a metal wire or piece of wood to the part thro' which you mean to make the fluid paſs. It is obvious, that in this caſe the circuit between the inſide and the outſide of the jar is not completed, therefore the ſhock will not be felt. The condenſed fluid paſſes in a denſe ſlow ſtream through the required part, while the outſide acquires a ſufficient quantity from ſubſtances near it to reſtore the equilibrium.

It is in all caſes moſt adviſable to begin with the more gentle operations, and proceed gradually to increaſe the force as the ſtrength and conſtitution of the patient or the nature of the diſorder requires. The ſtream from a wooden point, a wooden ball, or braſs point, may be firſt uſed; ſparks, if neceſſary, may then be taken, or ſmall ſhocks given.

In rheumatic caſes the electric friction is generally uſed. If the pains are local, ſmall ſhocks may be given. To relieve the toothache, very ſmall ſhocks may be paſſed through the tooth; or, cover the part affected with flannel, and rub it with a director communicating with the machine.

In inflammations and other diſorders of the eyes, the fluid ſhould be thrown from a wooden point: the ſenſation here produced is that of a gentle cooling wind; but, at the ſame time, it generates a genial warmth in the part affected.

In palſies, the electric friction and ſmall ſhocks are adminiſtered. Streams of the fluid ſhould always be made to paſs through the affected part.

The only treatiſe we have yet had from the faculty on the ſubject of medical electricity is a pamphlet, intitled, Conſiderations on the Efficacy of Electricity in removing Female Obſtructions, by Mr Birch; and if its merits were to be confined to this diſeaſe alone (in which it may be reckoned a ſpecific), it would be intitled to the attention of practitioners; but we have reaſon to expect much more from it, ſince the prejudices of the faculty ſeem removed, and the practice is becoming more general every day.

## SECT. XIII. *Of the Uſes of the Electric Fluid in the Syſtem of Nature at large.*

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Electricity concerned in the production of clouds, rain, hail, ſnow, &c.

THESE are ſo many and ſo various, that it may be ſaid without much exaggeration, that whether we look to the heaven above or to the earth beneath, we can ſcarce perceive any thing that is not acted upon, and in a manner perfectly ſubjected to the operations of this wonderful fluid. If we attend to the common phenomena of our atmoſphere, experiments ſhow that electricity is connected with every one of them. If we evaporate water by means of heat, it appears from the experiments of M. Sauſſure, related n° 201. *et ſeq.* that a ſtrong electricity is produced. If vapour is condenſed into rain, a quantity of electricity is alſo produced; and if water is frozen into ice, if it deſcends in hail or ſnow, electricity appears to be equally concerned. When clouds emit their electricity in great quantities, they inſtantly diſſolve in rain; which is more or leſs heavy according to the quantity of electricity diſcharged, as in thunder-ſtorms; and when this quantity is exceſſive, a vaſt many diſcharges are frequently made before the rain can deſcend. Hence it is reaſonable to conclude, that though heat may be the cauſe of the firſt riſe of vapour, it is the electric fluid which unites it with the air in ſuch a manner as to be perfectly diſſolved and become tranſparent in it (p). This is confirmed by an obſervation related under the article Cloud; namely, that ſmall clouds floating in the atmoſphere will frequently be ſeen to attract one another, and ſo meet together; after which, if they have been of nearly an equal ſize, both will almoſt inſtantly vaniſh. Tranſparency itſelf, as we have ſeen in many inſtances through the courſe of this treatiſe, depends on the vibratory motion of the electric fluid; and when we are aſſured that it depends on this in ſeveral caſes, we may conclude from analogy that it does ſo in all. In the caſe of vapour diſſolved in the atmoſphere, therefore, as long as this particular motion continues through it, the vapour remains diſſolved and tranſparent; but when the electricity comes to be diſpoſed to aſſume the other motion, of which it is exceedingly ſuſceptible, *viz.* that of running in a ſtream from one place to another, the vibratory motion ceaſes, the vapour formerly diſſolved loſes its tranſparency, and appears in the form in which it was originally raiſed by heat, *viz.* that of an opaque ſmoke or miſt. As this miſt muſt always be electrified (for it is in the diſpoſition of the fluid to fly to a diſtant place that electricity conſiſts), the fluid then begins to exert its power of attraction, and the miſt collects in bodies larger or ſmaller according to the quantity of motion with which the electric matter is affected: and thus we ſee how by means of this diſpoſition of the fluid, cloudy weather, rain, or the moſt violent thunder-ſtorms, may be produced.

269
It regulates the heat of the different climates.

On looking farther into the operations of nature, we find the electric fluid acting in a ſtill higher capacity, and regulating the temperature of the different climates throughout the world. Under the article Chemistry, n°99. it has been ſhown, that what is heat in ſummer becomes electric fluid in winter; and under the article Cold, it has been ſhown that cold as well as heat is a poſitive ſubſtance. In the preſent treatiſe it has been proved at length, that the electric fluid and the light of the ſun are the ſame; the former being in truth no other than the ſolar light abſorbed by the earth, entangled among its particles, becoming ſubject to new laws, and acting in many caſes as if it were a diſtinct fluid. Hence it becomes a proper antagoniſt to the light itſelf: for as the latter is only the fluid of electricity moving in a vibratory manner, and what we call electricity is the ſame fluid either in a comparatively ſtagnant ſituation, or diſpoſed to run with violence from one place to another; it is plain that the motion of the light muſt be oppoſed by the fluid tho' ſtagnant, and much more if it be moving in any oppoſite manner. But the action of light when augmented is heat: the power which oppoſes it therefore, *i. e.* the electric fluid moving in an oppoſite direction, as explained under Chemistry, n° 102. is *cold* itſelf; and hence the ſtrong electric appearances in the atmoſphere in cold countries, or in cold weather even in our own country. Hence alſo the electricity of the ſerene ſky is weaker in ſummer than in winter; and combuſtion, which is a very ſtrong vibratory action of the electric matter, produces no electricity, the one action being inconſiſtent with the other. The electric fluid therefore regulates the light and heat of the ſun throughout the whole world, and is itſelf regulated by them; ſo that neither heat nor cold can ultimately predominate any where.

Deſcending from the atmoſphere into the earth itſelf, we find the electric matter no leſs concerned there than in the atmoſphere. It has been already obſerved, that its vibratory motion probably gives tranſparency to all bodies. Sometimes this motion is augmented to a great degree, as in the waters of the ocean, which become unuſually clear before tempeſts and hurricanes. Its action in producing earthquakes is explained at large under the article Earthquake, as well as in ſetting fire to volcanoes under the article Volcano. Like other fluids, its action ſeems to gain a great increaſe of power when it runs for a conſiderable way along any conductor. This may be eaſily conceived from the conſideration, that the ſubſtance along which it runs is every where preſſed by a fluid of the ſame kind, which continually accelerates its motions, and at laſt gives them an intenſity capable of acting as the moſt vehement fire. The fact has been long obſerved, and is confirmed by the experiments of Mr Wilſon in the Pantheon as well as by thoſe of later electricians. In the former, the ſpark taken from a vaſt conductor of 155 feet in length, was ſo ſtrong that it reſembled the diſcharge of a large jar, or rather a ſmall battery; and was ſo very pungent, that few who had tried it once would venture on a ſecond experiment. The lateſt experiments were made with a number of tin conductors joined to each others ends: in which ſituation it was found that the ſpark taken from them was much ſtronger than when they were laid at each others ſides, though the ſurface was in both caſes exactly the ſame. Hence we ſee, that if by any means the electric fluid ſhall meet with an unuſually good conductor for a conſiderable way through the earth, the extremity of that conducting part may be heated, ſet on fire, or violent exploſions iſſue from it; and the ſame thing will take place in the atmoſphere. Upon this principle then may we account for natural hot-baths; exploſions ſuddenly iſſuing from the earth, by which people have ſometimes been killed; clouds and whirlwinds charged with an enormous quantity of electricity, and far beyond what in the ordinary way they could contain, &c.

Thus, to the action of the electric fluid we are in an eſpecial manner to aſcribe the temperature of the air throughout the whole globe; all the phenomena of rain, ſnow, hail, lightning, tempeſts, and in all probability the currents of the air itſelf named *winds*. Certain it is at leaſt, that every electrified ſubſtance has an atmoſphere round it reſembling a gentle blaſt of

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(p) In this there appears ſome inaccuracy of expreſſion: but as it is ſomewhat difficult to find terms at once ſufficiently accurate and intelligible, we ſhall hear obſerve, that by the word *heat* we mean the electric or univerſal fluid moving in a certain manner, *viz.* from a centre to a circumference; by *cold*, the ſame fluid preſſing from a circumference to a centre; by the *electric fluid* ſimply, the ſame either comparatively ſtagnant, or moving in any other way than thoſe juſt mentioned.

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of cool air; and it is alſo very remarkable, that the electric fluid itſelf cannot be blown away from any ſubſtance, even by the moſt violent blaſt of air we can imagine. An undoubted evidence of this is, that if you ſet up a ſmall ball or pointed body upon the conductor of a ſtrong machine, ſo that a ſtream of electric light may iſſue from it, it will not be in your power to turn this flame aſide in the ſmalleſt degree by the moſt violent blaſt of a bellows. On the contrary, if any body is preſented to it which has a tendency to attract, the flame will move acroſs the blaſt of air directly contrary to it, or in the ſame direction with it, in the very ſame manner as if no ſuch thing was preſent. As the electric fluid therefore acts independent of the air, and cannot have its motions controlled by it, it is highly probable that all the motions of the atmoſphere are controlled by this fluid alone: and indeed if we allow it to be the proper antagoniſt to the light of the ſun itſelf, we muſt readily allow it alſo to be the regulator of every other power on this earth.

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Its effects on vegetation have been treated of in the laſt ſection, though we cannot certainly ſay that it is the original cauſe of this proceſs. It ſeems, however, to be the true cauſe of CRYSTALLIZATION; which, as remarked under that article, probably is only an incipient or imperfect vegetation. The moſt convincing proof of this is from the experiments of Mr Lichtenberg with a large electrophorus; in which the knob of an electrified phial being drawn over the ſurface of the electric plate, finely powdered roſin afterwards ſifted upon the place aſſumed the figure of ſtars and other beautiful ramifications, indicating not only an inclination to arrange itſelf in the ſame regular order with the cryſtals of ſalts, but to run out into branches like thoſe of vegetables.

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Theſe experiments have been repeated to great advantage by the Reverend Mr Bennet, according to whoſe method the figures repreſented in Plate CLXXIX were made. The apparatus uſed for making them conſiſted only of a common Leyden phial, and a plate of glaſs 15 inches ſquare covered on one ſide with a varniſh of gum lac diſſolved in ſpirit of wine (Q), and ſeveral times laid over. The other ſide is covered with tin-foil laid on with common paſte. When it is to be uſed, the glaſs-plate is put upon a metallic ſtand with the tin-foiled ſide laid undermoſt; the phial is to be charged, and the knob drawn over the varniſhed ſide. Thus any kind of figure may be drawn or letters made as repreſented in the plate; and from every figure beautiful ramifications will proceed, longer or ſhorter according to the ſtrength of the charge. On ſome occaſions, however, the charge may be too ſtrong, particularly where we wiſh to repreſent letters, ſo that the whole will be blended into one confuſed maſs. The round figures are formed by placing metallic rings or plates upon the electrical plate; and then giving them a ſpark from the electrified bottle, or ſending a ſhock through them. The figures may be rendered permanent by blowing off the looſe chalk, and clapping on a piece of black-ſized paper upon them; or if they are wanted of another colour, they may eaſily be obtained by means of lake, vermilion, roſe-pink, or any of the ordinary colours ground very fine. The eaſieſt way of applying them ſeems to be by a barber's puff-bellows.

Uſes in the Syſtem of Nature

This tendency of the electrical fluid to produce ramifications in its paſſage through other ſubſtances, is likewiſe evident from the figure of the poſitive flaſhes deſcribed by Mr Nicholſon, and repreſented Plate CLXXVIII. It may indeed be objected, that in both caſes the fluid has to make its way thro' non-conducting ſubſtances, where it meets with a conſiderable reſiſtance; ſo that the caſe cannot be applicable to vegetation, where a ready conductor is always found in the moiſture with which the earth abounds. But if we conſider that the earth, and every thing contained in it, is already ſaturated with electric matter, it muſt readily appear that no new quantity can be forced into it without meeting with a conſiderable reſiſtance; and therefore it will branch out and divaricate in the very ſame manner when paſſing through the earth, that it does when artificially ſent through the air, or made to diffuſe itſelf on the ſurface of an electric ſubſtance. If in the earth it meets with ſuch particles as ſerve to facilitate its paſſage, theſe will be arranged according to the direction of the fluid itſelf; and thus theſe particles being conſolidated by other powers, or by electricity itſelf acting in a different manner, may be ſuppoſed to aſſume the figures of branched roots; while the continual accumulation of new matter augments them in bulk, and is what we call the *growth* of the plant, or its drawing nouriſhment from the ground. It is not indeed pretended that we can explain the manner in which plants grow; the utmoſt we can do is to attain ſome ſlight and general idea of the cauſe, and how by the action of that cauſe, directing itſelf according to the laws given it by the Author of nature, the effects may be produced. This is ſufficient to ſatisfy the curioſity natural to the human mind: a farther knowledge would not only be entirely uſeleſs, but in all probability is inconſiſtent with the limited ſtate of our faculties at preſent. What is here ſaid concerning vegetation, may be applied equally to the formation and growth of animal bodies; but this ſubject is ſtill more obſcure and difficult: it has been ſuppoſed by many, however, that the nervous fluid is the ſame with that of electricity; for which many probable reaſons might be aſſigned, though the ſubtilty and inviſibility of both muſt for ever prevent us from obtaining any direct proof on this ſubject.

274
Is the cauſe of magnetiſm, and probably of attraction of every kind.

When we conſider the reſt of the terreſtrial phenomena, we find the ſame fluid concerned in every one of them, or rather acting as their only cauſe. There is not in nature a more ſurpriſing phenomenon than that of the magnet; and this, by repeated experiments, has been proved to depend on electricity. Magnetical needles have often been endowed with their virtue by means of artificial electricity, and iron has been known to receive it from lightning; whence we may reaſonably conclude, that the power of the magnet at all times depends upon the ſecret operation of the electric fluid. By extending its power to the production of attractive and repulſive forces in all caſes, and which from many na-

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(Q) Two ounces of ſhell-lac powdered and mixed with ſix ounces of ſpirit of wine anſwers very well for this purpoſe. The glaſs muſt be warmed, and the varniſh ſpread upon it with a camel's hair pencil. Care muſt be taken, however, not to lay it on too thick, otherwiſe the effect will not follow.

natural phenomena is extremely probable, we ſhall ſtill give it a higher rank in the ſyſtem of nature. We ſhall now find it guiding the planets in their courſes through the heavens, giving ſtability and coheſion not only to terreſtrial ſubſtances, but to the globe of earth itſelf, and to all other bodies in the univerſe.

275 Count Treſſan's ſyſtem of natural philoſophy.

A ſyſtem of natural philoſophy on this principle was begun in the year 1747, and lately publiſhed by the Count de Treſſan. In this the electric fluid is conſidered as the firſt principle of motion in the univerſe, and the immediate agent by which the ſyſtem of nature is governed. According to him, the fixed ſtars themſelves are no other than as many foci of action communicating electricity to their ſurrounding planets, which have electric atmoſpheres of different extents. He ſhows the operation of the fluid in all the different phenomena of earth, air, water, fire, &c. deſcending even to the moſt minute, as well as conſidering the moſt grand and ſublime, exhibitions of nature. That the electric fluid is capable of imitating many of theſe phenomena, is certain; as for example, thoſe of earthquakes, water-ſpouts, tides, &c. of which an account is given under their proper articles. By means of the ſame fluid alſo we may imitate the planetary motions; and for this ſeveral contrivances have been fallen upon: the principal are as follow.

276 Methods of imitating the planetary motions.

1. From the prime conductor of an electric machine ſuſpend ſix concentric hoops of metal at different diſtances from one another, in ſuch a manner as to repreſent in ſome meaſure the proportional diſtances of the planets. Under theſe, and at the diſtance of about half an inch, place a metallic plate, and upon this plate, within each of the hoops, a glaſs-bubble blown very thin and light. On electrifying the hoops, the bubbles will be immediately attracted by them, and will continue to move round the hoops as long as the electrification continues. If the electricity is very ſtrong, the bubbles will frequently be driven off, run hither and thither on the plate, making a variety of ſurpriſing motions round their axis; after which they will return to the hoop, and circulate as before; and if the room is darkened, they will all appear beautifully illuminated with electric light.

2. Provide a ball of cork about three quarters of an inch in diameter, hollowed out in the internal part by cutting it in two hemiſpheres, ſcooping out the inſide, and then joining them together with paſte. Having attached this to a ſilk thread between three and four feet in length, ſuſpend it in ſuch a manner that it may juſt touch the knob of an electric jar, the outſide of which communicates with the ground. On the firſt contact it will be repelled to a conſiderable diſtance, and after making ſeveral vibrations will remain ſtationary; but if a candle is placed at ſome diſtance behind it, ſo that the ball may be between it and the bottle, the ball will inſtantly begin to move, and will turn round the knob of the jar, moving in a kind of ellipſis as long as there is any electricity in the bottle. This experiment is very ſtriking, tho' the motions are far from being regular; but it is remarkable that they always affect the elliptical rather than the circular form.

3. Cut a piece of India paper in the ſhape of an iſoſceles triangle, whoſe ſides are about two inches long, and two-tenths of an inch in breadth; then erect a braſs ball of two or three inches diameter on a braſs wire one-ſixth of an inch in thickneſs, and two feet ſix inches long, on the prime conductor: electrify the conductor, and then bring the obtuſe end of the piece of paper within the atmoſphere of the ball; let it go, and it will revolve round the ball, turning often round its own axis at the ſame time.

27 Object from a Mr M ſwered

We ſhall not here enter into any ſpeculations concerning the way in which it might be ſuppoſed poſſible to produce the planetary motions by means of the efflux of the ſun's light, and the return of the electric fluid towards him. Before we can make excurſions into theſe celeſtial ſpaces, it is abſolutely neceſſary to remove an objection derived from Mr Morgan's experiment, that the electric fluid cannot pervade a perfect vacuum; and from which he concludes, that the electric fluid cannot paſs beyond the limits of our atmoſphere. On this experiment, however, we muſt obſerve, that though it were really proved in a much more deciſive manner than is done by this experiment, that the fluid cannot be *artificially* driven through a vacuum, this would not prove that it cannot naturally paſs through it, unleſs we ſhould ſuppoſe the powers of nature and of art to be equal to one another. But that even the powers of art, in Mr Morgan's experiment, have not a fair chance of ſucceſs, is evident from an inſpection of fig. 80. Here he endeavours to force the electric fluid through a long courſe of perfect vacuum, and finds the power of his machine inſufficient for the purpoſe. Yet one of Mr Morgan's own experiments might have led him to vary this one in ſuch a manner as would perhaps have ſhown the poſſibility of tranſmitting the fluid through the moſt perfect vacuum that can be made. He informs us, that a ſpark, which in the open air cannot exceed one quarter of an inch diameter, will appear to fill the whole of an exhauſted receiver four inches wide and eight inches long; tho' in the latter caſe it will be exceſſively faint in compariſon with what it would have been in the atmoſphere: yet, in order to prove that the faintneſs of the electric light *in vacuo* depends on the enlarged ſpace through which it is diffuſed, we have only to introduce two pointed wires into the vacuum, ſo that the fluid may paſs from the point of the one to the point of the other; and when the diſtance between them is not more than the tenth of an inch, in this caſe we ſhall find the ſpark as bright as in the open air.

The inference to be derived from this experiment is obvious. Had Mr Morgan, inſtead of attempting to cauſe the fluid paſs through the whole length of the vacuum, put two wires in the inſide at a ſmall diſtance from each other, as deſcribed in the experiment juſt now mentioned, it is very probable that the fluid would have made its way through that ſmall diſtance. It muſt be acknowledged indeed, that, conſidering the very great difficulty of making this experiment at any rate, we could ſcarce expect that this additional trouble could be taken: but without this, or ſomething equivalent, his concluſion cannot by any means be allowed to be juſt; nor, even if it had been tried, would it have determined the queſtion in his favour.

The great difficulty in this experiment is to give a reaſon why in a certain degree of exhauſtion the vacuum ſhould be ſo eaſily penetrated by the fluid, and in another ſhould make ſuch reſiſtance; but the following conſiderations will probably throw ſome light on this.

Fig. 81.

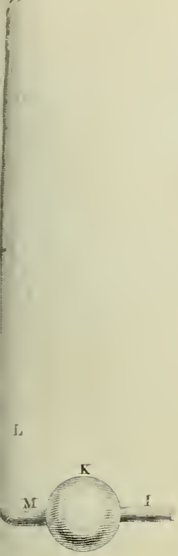


Fig. 80.

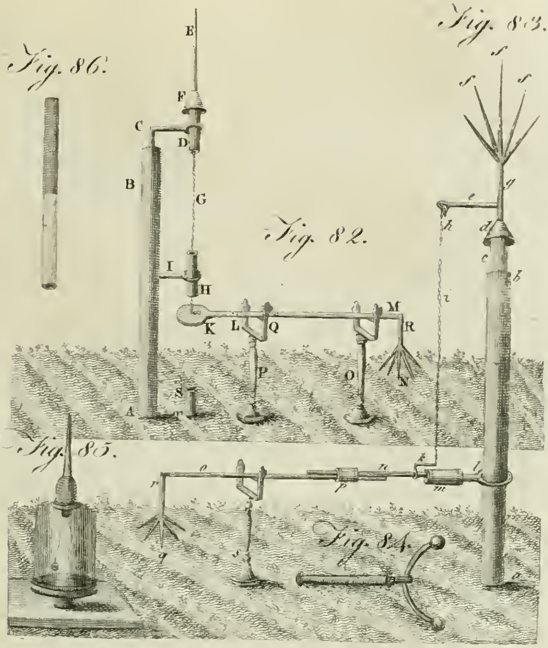
Fig. 86.

Fig. 82.

Fig. 83.

Fig. 85.

Fig. 84.



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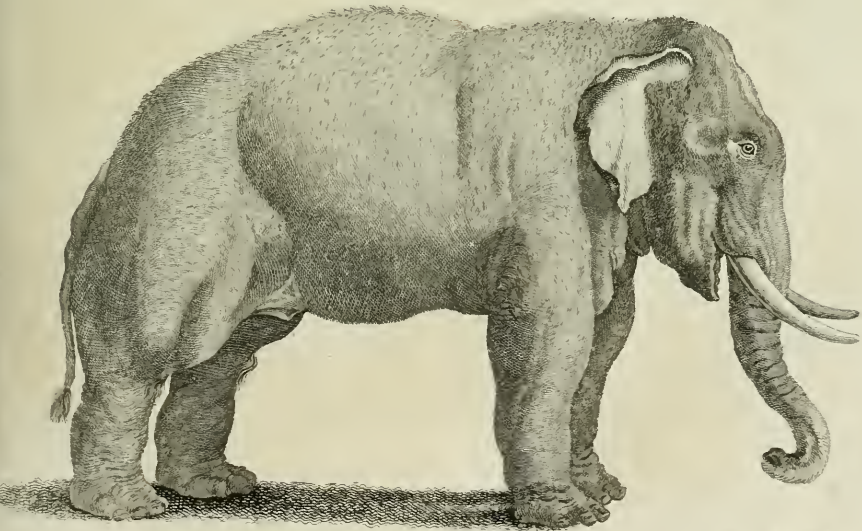

A. Bell Prin. Wal. Sculptor fecit.

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this ſubject. 1. In all caſes where the fluid is obliged to pervade the ſubſtance of any medium whatever, it moves with difficulty. Thus, if a vaſt quantity of electricity is ſent through a ſmall wire, the reſiſtance it meets with is ſo great that the wire is diſperſed with violence; and if the battery is large, it cannot be totally diſcharged, as was the caſe with Dr Van Marum's battery, mentioned n° 150. Again, if the ſpark be taken in water, a moſt violent exploſion takes place; and yet both metals and water are good conductors of electricity. 2. In all caſes where we ſet the electric fluid in motion, the utmoſt we can do is to give it a tendency to circulate; and unleſs we allow it to do ſo, no electricity will be produced. Thus, if we extricate the fluid from the earth by means of an electrical machine, diſcharge it upon a conductor, and form a communication between that and another part of the earth, the circulation will go on very readily, and the fluid will eaſily return to the place from whence it came. If the communication betwixt the earth and conductor be cut off by an electric, the circulation will nevertheleſs go on; the fluid will evaporate in the air, and from thence reach the earth by channels inviſible to us. The effect will be the ſame in all caſes where its motion in a certain direction is ſtopped: but what we call *ſtopping* it, is only rendering its paſſage more difficult in one particular place than in another; for as to any abſolute ſtop or impediment, ſuch as could reſiſt the whole force of the fluid, as Mr Morgan ſuppoſes, there is not the leaſt probability that it exiſts in nature. The whole that can be inferred from Mr Morgan's experiment therefore is, that the electric fluid will more readily evaporate and paſs ſilently thro' the air than through a complete vacuum. The queſtion, however, ſtill recurs: Since this fluid paſſes very readily through rarefied air, why does it heſitate after a certain degree of rarefaction, and at laſt ſtop altogether when the air is totally exhauſted? To this it may be replied, that when air is heated it becomes leſs electric than when cold, and by an increaſe of heat becomes at laſt an excellent conductor. On the other hand, by an increaſe of cold its electric properties become proportionably greater, and conſequently the difficulty with which the fluid gets through it increaſes in proportion. Under the article *ELASTIC Vapours*, it is ſhown that the true principle of elaſticity is *heat*; and under the article CHEMISTRY, n° 99. it is ſhown, that heat and electricity are convertible into one another. In proportion as the air is rarefied, therefore, it abſorbs heat, and conſequently becomes a better conductor; but when it is totally exhauſted, nothing remains but the fluid of electricity itſelf; the ſame indeed with that of heat, but deprived of motion, and conſequently capable of making a much greater reſiſtance. Now the ſtrongeſt ſpark that can be drawn from any of our machines perhaps does not equal $\frac{1}{100}$th of an inch in diameter, as appears from the holes made by them in paper or cards when pierced, as directed in Sect. VIII. But when a perfect vacuum is made, this ſmall ſpark is obliged to act upon a cylinder of electric matter perhaps 6000 or 7000 times greater in diameter than itſelf, each point of which reſiſts with the whole force the exploſion itſelf has; and what is worſe, the whole of this muſt be put in motion before any diſcharge can be made. The reſiſtance therefore is ſo violent, that the fluid rather paſſes through the air as already explained: nevertheleſs, if it were poſſible to make a perfect vacuum of no greater diameter than that of the electric ſpark, there is no reaſon to ſuppoſe that it would not be penetrated by it; and of this Mr Morgan's experiments with the two wires above mentioned ſeems to be a confirmation.

Uſes in the Syſtem of Nature.

On the whole, it is evident, that we cannot from this or indeed any other experiment argue againſt the poſſibility of the paſſage of the electric fluid from any part of the creation to another. *We* cannot force it, it is true, becauſe it is diſpoſed by its own natural laws to reſiſt our efforts; but where it is diſpoſed by theſe laws to yield in one place, there will undoubtedly be a current of it thither from ſome other, which we would find ourſelves equally unable to ſtop by all the machines that ever have been or will be invented. There is as yet therefore not the leaſt proof that the electric fluid does not pervade the moſt diſtant regions of ſpace, and there perform all thoſe great operations which have been aſcribed to unknown and inexplicable powers. For a further account of the operations of this fluid in producing the phenomena of nature, ſee the articles ATMOSPHERE, *AURORA Borealis*, EARTHQUAKE, HAIL, HURRICANE, LIGHTNING, METEOR, RAIN, SNOW, &c.

# INDEX.

rides
uary.

ELECTRIDES, anciently iſlands in the Adriatic ſea, which received their name from the quantity of amber *(electrum)* which they produced. They were at the mouth of the Po, according to Apollonius of Rhodes, but ſome hiſtorians doubt of their exiſtence.

ELECTROMETER. See Electricity, n° 27.

ELECTROPHORUS. *Ibid.* n° 16.

ELECTRUM, in natural hiſtory. See Amber.

ELECTUARY, in pharmacy, a form of medicine compoſed of powders and other ingredients, incorporated with ſome conſerve, honey, or ſyrup; to be divided into doſes, like boluſes, when taken.

Voſſius obſerves, that all the remedies preſcribed for the ſick, as well as the confections taken by way of regale. were called by the Greeks εκλειγματα, and εκλεικτα, of the verb λειχω, "I lick;" whence, ſays he, was formed the Latin *electarium*, and afterwards *electuarium*. This conjecture he ſupports from the laws of Sicily, where it is ordained, that *electuaries*, ſyrups, and other remedies, be prepared after the legal manner. The Bollandiſts, who relate this etymology, ſeem to confirm it. For the compoſition and different ſorts of electuaries, ſee Pharmacy.

Eleemoſyna, Eleemoſynarius.

ELEEMOSYNA *Carucarum*, or *pro Aratris*, or *Aratri.* in our ancient cuſtoms, a penny which king Ethelred ordered to be paid for every plough in England towards the ſupport of the poor. Sometimes it is alſo called *eleemoſyna regis*, becauſe firſt appointed by the king.

ELEEMOSYNARIUS, in our our old writers, is uſed for the almoner or peculiar officer who received the eleemoſynary rents and gifts, and diſtributed them

to

to pious and charitable uſes. There was ſuch an officer in all religious houſes. The biſhops alſo uſed to have their almoners, as now the king has.

ELEGANCE, (from *eligo* "I chooſe,") denotes a manner of doing or ſaying things politely, agreeably, and with choice. With choice, ſo as to riſe above the common manners; politely, ſo as to ſtrike people of delicate taſte; and agreeably, ſo as to diffuſe a reliſh which gratifies every body.

ELEGANCE, in oratory and compoſition, an ornament of politeneſs and agreeableneſs ſhown in any diſcourſe, with ſuch a choice of rich and happy expreſſions, as to riſe politely above the common manners, ſo as to ſtrike people of a delicate taſte.

It is obſerved, that elegance, though irregular, is preferable to regularity without elegance: that is, by being ſo ſcrupulous of grammatical conſtruction, we loſe certain licences wherein the elegance of language conſiſts.

ELEGIAC, in ancient poetry, any thing belonging to elegy. See ELEGY.

ELEGIT, in law, a writ of execution, which lies for a perſon who has recovered debt or damages; or upon a recognizance in any court, againſt a defendant that is not able to ſatisfy the ſame in his goods.

ELEGY, a mournful and plaintive kind of poem. See the article POETRY.

ELEMENTS, in phyſics, the firſt principles of which all bodies in the ſyſtem of nature are compoſed.

Theſe are ſuppoſed to be few in number, unchangeable, and by their combinations to produce that extenſive variety of objects to be met with in the works of nature.

That there is in reality ſome foundation for this doctrine of elementary bodies is plain; for there are ſome principles evidently exempted from every change or decay, and which can be mixed or changed into different forms of matter. A perſon who ſurveys the works of nature in an inattentive manner, may perhaps form a contrary opinion, when he conſiders the numerous tribes of foſſils, plants, and animals, with the wonderful variety that appears among them in almoſt every inſtance. He may from thence be induced to conclude, that nature employs a vaſt variety of materials in producing ſuch prodigious diverſity. But let him inquire into the origin of this apparent diverſity, and he will find that theſe bodies which ſeem the moſt different from each other are at bottom nearly the ſame. Thus the blood, chyle, milk, urine, &c. as well as the various ſolid parts of animals, are all compoſed of one particular ſubſtance; graſs, for inſtance, by the aſſiſtance of air and water, and even ſometimes of very inſipid kinds of graſs. The ſame ſimplicity preſents itſelf in the original compoſition of the nouriſhment of vegetables, notwithſtanding the variety among them with reſpect to hardneſs, ſoftneſs, elaſticity, taſte, odour, and medical qualities. They chiefly depend, for theſe, upon water and the light of the ſun; and the ſame ſimplicity muſt take place in animals that are fed on vegetables. The analyſis of animal ſubſtances confirm this hypotheſis; for they can all be reduced into a few principles, which are the ſame in all, and only differ with regard to the proportions in which they are combined. With regard to animals, the caſe appears to be the ſame: and the more we are acquainted with them, the more reaſon we have to believe that the variety in their origin is very ſmall.

Notwithſtanding the infinite variety of natural productions, therefore, it appears, that the materials employed in their production are but few; that theſe are uniformly and certainly the ſame, totally exempted from any change or decay; and that the conſtant and gradual change of one body into another is produced by the various ſeparations and combinations of the original and elementary parts, which is plain from the regularity and uniformity of nature at all times. There is a change of forms and combinations through which it paſſes, and this has been the caſe from the earlieſt accounts of time; the productions of nature have always been of the ſame kind, and ſucceeded one another in the ſame order. If we examine an oak, for inſtance, we find it compoſed of the ſame matter with that of any other that has exiſted from the earlieſt ages. This regularity and uniformity in the courſe of nature ſhows that the elementary parts of bodies are permanent and unchangeable; for if theſe elementary particles which conſtituted an oak ſome thouſand years ago, had been undergoing any gradual decay, the oaks of the preſent times would have been found conſiderably different from thoſe that exiſted long ago; but as no difference has been obſerved, it would ſeem that the ultimate elements of bodies have always continued the ſame.

Reflections of this kind have ſuggeſted an idea of ſeveral principal elements of which all other bodies are compoſed, which by their various combinations furniſhed all the variety of natural bodies. Democritus, and other great philoſophers of antiquity, fixed the number to four, which have retained the name of elements ever ſince. Theſe are, fire, air, earth, and water; each of which they imagined was naturally diſpoſed to hold its own place in the univerſe. Thus, the earth, as heavieſt, naturally tended towards the centre, and occupied the lower parts; the water, as approaching next to it in gravity, was ſpread chiefly on the outſide of the earth; the air, being more ſubtle and rare, occupied the middle place; while the fire, being ſtill more ſubtile and active, receded to the greateſt diſtance of all, and was ſuppoſed to compoſe the planets and ſtars. This ſyſtem was extended to all the productions of nature. Meteors were produced from a combination of fire and air; animals were conſidered as compoſed of earth and water; and thoſe that were warm had likewiſe a proportion of the element of fire. Thus they went on, explaining ſome of the moſt ſtriking qualities of the ſeveral productions of nature from the different proportions of the four elements they contained.

But though this ſyſtem appears not at all deſtitute of beauty and propriety, and on this account has been in ſome meaſure received even to the preſent time, we find reaſon to doubt whether theſe four ſubſtances be really elementary bodies; nor do they anſwer our purpoſe in forming a ſyſtem, as we know too little of the intimate ſtructure and texture of them to enable us to explain other bodies by them.

Any other attempts that have been made to aſſign the number of elementary bodies have been much leſs fortunate. The chemiſts, with Paracelſus at their head, pretend to ſpeak of four elementary bodies, ſalt, ſulphur, earth, and mercury: but when we attempt to form an idea of what they mean, we find it very perplexed; and that the expreſſions concerning them are enveloped in ſo much obſcurity, that they cannot be comprehended; and the theory is built entirely upon experiments made on metallic ſubſtances.

Under the article Chemistry, n° 26. we have ſhown, that the elements, whatever they are, muſt neceſſarily be inviſible or imperceptible by any of our ſenſes. An inquiry into their number or properties therefore muſt be attended with very little ſucceſs; and all the knowledge we can have upon the ſubject muſt be drawn from a view of their combinations, and reaſoning analogically from the tranſmutations we obſerve to take place in nature. The modern diſcoveries in aerology have enabled us to proceed farther in this way than what it was poſſible for the ancient philoſophers to do. We now find that all the different kinds of air are compoſed of that inviſible and ſubtile fluid named *heat*, united in a certain way with ſome other ſubſtance: by which union the compound acquires the properties of gravitation, expanſion, rarefaction, &c. for pure heat, unleſs when united with ſome terreſtrial ſubſtance, neither gravitates nor expands. This is evident from the phenomena of the burning-glaſs, where the light concentrated in the focus will neither heat the air nor water, unleſs it meets with ſomething with which it can form a permanent union. Heat therefore is juſtly to be conſidered as one of the original elements; being always capable of uniting with bodies, and of being extricated from them unchanged; while the ſame bodies are by their union with it changed into various forms; water, for inſtance, into ice or vapour, both of which return into their original ſtate by the abſtraction or addition of heat in a certain degree. Hence it becomes almoſt natural to conclude, that there are only two elements in the univerſe: and this opinion we find adopted by ſeveral philoſophers, particularly the Count de Treſſan in his Eſſay on the Electric Fluid. According to this doctrine, two primitive material ſubſtances ſeem to exiſt in nature; one that inceſſantly acts, and to which it is eſſential to be in motion; the other abſolutely paſſive, and whoſe nature it is to be inert, and move entirely as directed by the former. Should this doctrine be adopted, little difficulty would occur in determining the active matter to be that univerſal fluid which in its various modifications of light, heat, and electricity, has ſuch a ſhare in the operations of nature. But in fixing on the paſſive element we are greatly embarraſſed; nor are the diſcoveries in aerology or any other ſcience as yet able to remove the difficulty entirely. In our experiments on this and ſome other parts of chemiſtry, we find three things that ſeem to be unchangeable, viz. earth; phlogiſton; and that inviſible, though terreſtrial and gravitating principle called by the antiphlogiſtians the *oxygenous* or acidifying principle, and by the phlogiſtians the baſis of dephlogiſticated air. In our experiments on the firſt, we find that earth, though vitrified by the moſt intenſe fire, may be recovered in its proper form; and ſome very pure earths, particularly magneſia alba, cannot be changed even in the focus of the moſt powerful mirror. In like manner we may diſſipate charcoal *in vacuo* by the ſolar rays, and the compound is inflammable air: we may decompoſe this compound by a metallic calx, and we have our charcoal again unchanged, for all metals contain charcoal in ſubſtance. Let us try to deſtroy it by common fire, and we have it then in the fixed air produced, from which it may be recovered unchanged by means of the electric ſpark. With the baſis of dephlogiſticated air the caſe is ſtill more difficult; for we cannot by any means procure a ſight of it by itſelf. We may combine it with heat, and we have dephlogiſticated air; to the compound we may add charcoal, and we have fixed air; by decompoſing the former by burning iron in it, we have the metal greatly increaſed in weight by ſome unknown ſubſtance; and if we attempt to ſeparate the latter, we have water, or ſome kind of vapour, which ſtill conceals it from our view.

In ſome experiments made by Mr Watt, and of which an account is given under the article Acid, n° 12. we find that nitrous acid might be phlogiſticated by the pureſt earth or metallic calx; whence it is not unreaſonable to ſuppoſe that phlogiſton may be only a certain modification of earth, and not an element diſtinct from it: but with regard to the baſis of dephlogiſticated air, no experiment has ever ſhown that it can either be procured by itſelf, or changed into any other ſubſtance; ſo that it appears to have the nature of an element as much as light or heat. Though we ſhould therefore be inclined to divide the whole matter of the univerſe into two claſſes, the one active and the other acted upon, we muſt allow that the paſſive matter even on this earth is not preciſely of the ſame kind: much leſs are we to extend our ſpeculations in this reſpect to the celeſtial regions; for who can determine whether the ſubſtance of the moon is the ſame with that of our earth, or that the elements of Jupiter are the ſame with thoſe of Saturn? There is even a difficulty with regard to the diviſion which ſeems ſo well eſtabliſhed, *viz.* of matter in general into active and paſſive; for no perſon can prove, that the matter which is active in one caſe may not be paſſive in another, and occaſionally reſume its activity. Something like this certainly happens in the caſe of the electric fluid, which is modified into heat or light, according to different circumſtances; and we cannot know but it is the very ſame ſubſtance that conſtitutes the moſt ſolid bodies. This opinion at leaſt did not ſeem abſurd to Sir Iſaac Newton, who propoſed it as a query, Whether groſs bodies and light were not convertible into one another? The end of our inquiries on this ſubject therefore muſt be, That the univerſe may be compoſed of many elements, or of one element; and of the nature of theſe elements, or of the ſingle one, we know nothing.

**Element**, in a figurative ſenſe, is uſed for the principles and foundations of any art or ſcience; as Euclid's Elements, &c.

**Elements**, in aſtronomy, are thoſe principles deduced from aſtronomical obſervations and calculations, and thoſe fundamental numbers which are employed in the conſtruction of tables of the planetary motions. Thus, the elements of the theory of the ſun, or rather of the earth, are his mean motion and eccentricity, and the motion of the aphelia. The elements of the theory of the moon are its mean motion; that of its node and apogee, its eccentricity, the inclination of its orbit to the plane of the ecliptic, &c.

ELEMI, or Elemy, in the materia medica. See Amyris.

ELENCHUS, in antiquity, a kind of ear-rings ſet with large pearls.

Elenchus, in logic, by the Latins called *argumentum* and *inquiſitio*, is a vicious or fallacious argument, which deceives under the appearance of a truth; the ſame with what is otherwiſe called *ſophiſm*.

ELEPHANT, in zoology. See Elephas.

*American Elephant*: An animal only known in a foſſile ſtate, and that but partially, from the teeth, ſome of the jaw-bones, the thigh-bones, and vertebræ, found with many others five or ſix feet beneath the ſurface on the banks of the Ohio. But theſe bones differ in ſeveral reſpects from thoſe of the elephant; for which, ſee *Foſſil Bones*. As yet the living animal has evaded our ſearch. Mr Pennant thinks it "more than probable, that it ſtill exiſts in ſome of thoſe remote parts of the vaſt new continent unpenetrated yet by Europeans. Providence maintains and continues every created ſpecies; and we have as much aſſurance that no race of animals will any more ceaſe while the earth remains, than *ſeed-time and harveſt*, *cold and heat*, *ſummer and winter*, *day or night*. See Mammuth.

*Elephant-Beetle*. See Scarabæus.

*Knights of the Elephant*, an order of knighthood in Denmark, conferred upon none but perſons of the firſt quality and merit. It is alſo called the *order of St Mary*. Its inſtitution is ſaid to have been owing to a gentleman among the Daniſh croiſes having killed an elephant, in an expedition againſt the Saracens, in 1184; in memory of which, king Canutus inſtituted this order, the badge of which is a towered elephant, with an image of the holy virgin encircled with rays, and hung on a watered ſky-coloured ribbon, like the George in England.

ELEPHANTA, a ſmall, but very remarkable iſland about five miles from the caſtle of Bombay in the Eaſt Indies. Of this we have the following deſcription in Mr Groſe's Voyage to the Eaſt Indies. "It can at moſt be but about three miles in compaſs, and conſiſts of almoſt all hill: at the foot of which, as you land, you ſee, juſt above the ſhore, on your right, an elephant, coarſely cut out in ſtone, of the natural bigneſs, and at ſome little diſtance not impoſſible to be taken for a real elephant, from the ſtone being naturally of the colour of that beaſt. It ſtands on a platform of ſtones of the ſame colour. On the back of this elephant was placed, ſtanding, another young one, appearing to have been all of the ſame ſtone, but has been long broken down. Of the meaning, or hiſtory, of this image, there is no tradition old enough to give any account. Returning then to the foot of the hill, you aſcend an eaſy ſlant, which about half way up the hill brings you to the opening or portal of a large cavern hewn out of a ſolid rock, into a magnificent temple: for ſuch ſurely it may be termed, conſidering the immenſe workmanſhip of ſuch an excavation; and ſeems to me a far more bold attempt than that of the pyramids of Egypt. There is a fair entrance into this ſubterraneous temple, which is an oblong ſquare, in length about 80 or 90 feet, by 40 broad. The roof is nothing but the rock cut flat at top, and in which I could not diſcern any thing that did not ſhow it to be all of one piece. It is about 10 feet high, and ſupported towards the middle, at equidiſtance from the ſides and from one another, with two regular rows of pillars of a ſingular order. They are very maſſive, ſhort in proportion to their thickneſs, and their capital bears ſome reſemblance to a round cuſhion preſſed by the ſuperincumbent mountain, with which they are alſo of one piece. At the further end of this temple are three gigantic figures; the face of one of them is at leaſt five feet in length, and of a proportionable breadth But theſe repreſentations have no reference or connection, either to any known hiſtory or the mythology of the Gentoos. They had continued in a tolerable ſtate of preſervation and wholeneſs, conſidering the remoteneſs of their antiquity, until the arrival of the Portugueſe, who made themſelves maſters of the place; and in the blind fury of their bigotry, not ſuffering any idols but their own, they muſt have even been at ſome pains to maim and deface them, as they now remain, conſidering the hardneſs of the ſtone. It is ſaid they even brought field-pieces to the demolition of images, which ſo greatly deſerved to be ſpared for the unequalled curioſity of them. Of this Queen Catherine of Portugal was, it ſeems, ſo ſenſible, that ſhe could not conceive that any traveller would return from that ſide of India without viſiting the wonders of this cavern; of which too the ſight appeared to me to exceed all the deſcriptions I had heard of them. About two-thirds of the way up this temple, on each ſide, and fronting each other, are two doors or outlets into ſmaller grots or excavations, and freely open to the air. Near and about the door-way, on the right-hand, are ſeveral mutilated images, ſingle and in groupes. In one of the laſt, I remarked a kind of reſemblance to the ſtory of Solomon dividing the child, there ſtanding a figure with a drawn ſword, holding in one hand an infant with the head downwards, which it appears in act to cleave through the middle. The outlet of the other on the left hand is into an area of about 20 feet in length and 12 in breadth; at the upper end of which, as you turn to the right, preſents itſelf a colonade covered at top, of 10 or 12 feet deep, and in length anſwering to the breadth of the area: this joins to an apartment of the moſt regular architecture, an oblong ſquare, with a door in perfect ſymmetry; and the whole executed in quite a contrary taſte and manner from any of the oldeſt or beſt Gentoo buildings any where extant. I took particular notice of ſome paintings round the cornices, not for any thing curious in the deſign, but for the beauty and freſhneſs of the colouring, which muſt have laſted ſome thouſands of years, on ſuppoſing it, as there is all reaſon to ſuppoſe it, cotemporary with the building itſelf. The floor of the apartment is generally full of water, its pavement or ground-work not permitting it to be drawn off or to be ſoaked up. For it is to be obſerved, that even the cavern itſelf is not viſitable after the rains until the ground of it has had time to dry into a competent hardneſs."

ELEPHANTIASIS, called alſo the *lepra of the Arabians*, in medicine, a chronical diſeaſe, one of the two ſpecies of leproſy which affects the whole body, where even the bones as well as the ſkin are covered with ſpots and tumors, which being red at laſt turn black. See Medicine-*Index*.

ELEPHANTINE, or Elephantis (anc. geog.), an iſland in the Nile to the ſouth of Syene; with a cognominal town, where the navigation on the Nile ends, becauſe

becauſe juſt below the leſs cataract. And here to the weſt of the Nile ſtood the laſt Roman garriſon (Notitia Imperii).

ELEPHANTINE, in Roman antiquity, an appellation given to the books wherein were regiſtered the tranſactions of the ſenate and magiſtrates of Rome, of the emperors or generals of armies, and even of the provincial magiſtrates; the births and claſſes of the people, and other things relating to the cenſus.

They are ſuppoſed to have been ſo called, as being made of leaves of ivory or elephants tuſks.

ELEPHANTOMACHI. See ETHIOPIA.

ELEPHANTOPUS, in botany: A genus of the polygamia ſegregatæ order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ* The calyculus is quadriflorus, with hermaphrodite florets ligulated or plane; the receptacle is naked; the pappus briſtly.

ELEPHAS, the ELEPHANT, in zoology, a genus of quadrupeds belonging to the order of bruta. The characters are theſe: The elephant has no foreteeth in either jaw, and the dog-teeth are very long: the proboſcis or trunk is long, and capable of laying hold of any thing; and the body is ſomewhat naked.

The elephant is the largeſt of all land-animals. From the front to the origin of the tail he is generally about 16 feet long, from the end of the trunk 25 feet, and about 14 feet high. The circumference of the neck is 17 feet, and the circumference of the body at the groſſeſt part 25 feet 10 inches; the tail is about 6 feet long, and $2\frac{1}{2}$ in circumference. The circumference of the legs is about 6 feet. Theſe are the largeſt dimenſions. But the animal differs in ſize in different countries; in ſome not exceeding 7 feet in height. The eyes are ſmall in proportion to the ſize of the animal. The muzzle is very different from that of any other quadruped; it is nothing but the origin of a long trunk which hangs between the two large tuſks; the mouth appears behind the trunk, which ſerves in place of an upper lip, and the under lip terminates in a point. The feet are ſhort, round, clumſy, and only diſtinguiſhable by the toes. The trunk is, properly ſpeaking, the noſe extended, and terminated by a couple of noſtrils. But, beſides ſerving as an organ of ſmell, the trunk performs all the functions of a ſtrong and dexterous arm. The trunk of an elephant is about 8 feet long, $5\frac{1}{2}$ feet in circumference near the mouth, and one foot and a half near the extremity: it is a pipe of an irregular conical figure, and widened at the end: the ſuperior ſide of the trunk is convex, and furrowed tranſverſely, and the inferior ſide is flat, and has two longitudinal rows of ſmall protuberances reſembling the tentacula of the ſilk-worm and moſt other caterpillars. The upper part of the trunk correſponds with the extremity of the noſe in other quadrupeds, and anſwers the ſame intention; the inferior part ſerves as an upper lip, including the noſtrils at the ſame time. For the trunk is a continued canal, divided into two cavities by a longitudinal partition: theſe cavities aſcend along the forepart of the upper jaw, where they make a turn inward, and deſcend into the palate, and then terminate in two ſeparate orifices; they have likewiſe each a ſeparate orifice at the end of the trunk. At the place where theſe cavities make a turn, and before they enter into the bones of the head, there is a moveable cartilaginous plate ſituated in ſuch a manner as enables the animal to ſhut the canal, and to prevent the water with which it occaſionally fills the trunk from entering into the paſſage of the noſe where the organs ſerving for the ſenſation of ſmell are placed. The elephant can move the trunk in all directions; he can extend or ſhorten it at pleaſure, without altering the diameters of the two canals within. By this means reſpiration is not interrupted, whatever be the ſituation of the trunk; and the water is allowed to remain till the animal chooſes to throw it out by an exſpiration. Each canal is lined with a ſmooth ſtrong membrane, and the ſurface of the trunk is covered with another ſtrong membrane or ſkin. The ſubſtance contained between the exterior and interior membranes, is a compoſition of longitudinal and tranſverſe muſcles, which ſerve to extend and contract the length of the trunk. At the extremity of the trunk there is a concave protuberance, in the bottom of which are the two paſſages of the noſtrils. The inferior part of the protuberance is thicker than the ſides, and the ſuperior part is ſtretched out like a finger about five inches long; which, together with the edges of the whole extremity of the trunk, takes on different figures according to the neceſſities of the animal. It is by this organ that the animal lays hold of food or other ſubſtances; which he manages with as much dexterity as a man does his hand, taking up grains of corn, or the ſmalleſt piles of graſs, and conveying them to his mouth. When he drinks, he thruſts his trunk into the water, and fills it by drawing in his breath and exhauſting the air: when the trunk is thus filled with water, he can either throw it out to a great diſtance, or drink it by putting the end of the trunk in his mouth.

The two large tuſks, which ſome call the *horns* of the elephant, are of a yellowiſh colour, and extremely hard. The bony ſubſtance of which they are compoſed is known by the name of IVORY, and much uſed in different branches of manufacture.

The ears are very large, and reſemble thoſe of an ape. The ſkin of the elephant has but few hairs on it, and placed at great diſtances from each other. It is full of wrinkles, like thoſe on the palm of a man's hand, beſides many chapped and greaſy ridges. The female has two dugs, one on each ſide of the breaſt.

M. Buffon ſuppoſed the ancients to have been "deceived, when they tell us, that the elephants copulate like other quadrupeds, the female only lowering her crupper for the more eaſy reception of the male. The ſituation of the parts ſeems to render this mode of junction impoſſible. The female elephant has not like other quadrupeds the orifice of the vagina adjacent to the anus; for it is ſituated nearly in the middle of the belly, about two and a half or three feet diſtant from the anus. On the other hand, the male organ is by no means proportioned to the magnitude of his body, nor to ſo long an interval, which in the ſituation ſuppoſed would preclude the practicability of his approach. Naturaliſts as well as travellers agree in affirming, that the male organ of the elephant exceeds not either in length or diameter that of a horſe. It is, therefore, impoſſible that he ſhould attain his end in the ordinary poſition of quadrupeds. The female muſt neceſſarily lie on her back. De Feynes and Tavernier poſitively aſſert, and the ſituation of the parts confirms their evidence, that theſe animals cannot intermix in any other manner. They require, therefore, more time and conveniency for this operation than other quadrupeds; and it is perhaps for this reaſon that they never copulate but when they enjoy full liberty, and have every neceſſary article at their command. The female muſt not only conſent, but ſolicit the male, by a poſition which ſhe never aſſumes unleſs when ſhe thinks herſelf in perfect retirement." The fact, however, has been controverted by others. Dr Sparrman informs us, that in order if poſſible to determine the queſtion, he let ſlip no opportunity of interrogating on the ſubject every elephant-hunter he met with at the Cape; who all agreed in replying that they were moſt inclined to the common opinion, if they had not been differently informed by two of their companions, Jacob Kok and Marcus Potgieter, who had actually ſeen elephants copulate. "I met (ſays our author) only with the former of theſe hunters, who told me he had likewiſe himſelf been of opinion that the female was obliged to lie on her back on this occaſion; till at length, being out along with Potgieter hunting of elephants, he had occaſion to think otherwiſe. On a certain ſpot they came to, they could reckon about eight elephants, which, on account of the ſmall ſize of their tuſks, they took for females, excepting two large ones; which making ſeveral circles round one of theſe that they took for females (the only one perhaps in rut) frequently, in all probability by way of careſſing her, ſtruck her with their trunks, till at length ſhe threw herſelf down upon her knees, and keeping the ſpine of her back in a ſtiff and extended poſition, brought her hind-feet quite cloſe to her fore-feet, or ſomewhat beyond them; ſo that ſhe almoſt as it were ſtood upon her head. In this forced poſture they ſaw her wait a long while together for the careſſes of the males, who, in fact, likewiſe endeavoured to perform the matrimonial rites, but from jealouſy hindered each other whenever either of them began to mount. After two hours had thus elapſed, the patience of our hunters began to tire; and the rather, becauſe on account of the uneven and ſtoney nature of the ground, which, however, had no wood upon it, and of a river being between them, they could not dare to advance and fire at theſe animals. I will not diſſemble, that though I have not the leaſt occaſion to doubt the veracity of my informer, and though what he told me is by no means impoſſible, I yet find great difficulty in this matter. But on the other hand, the ſame may be ſaid of M. Buffon's or the common opinion; firſt, as they have not been able to confirm it by the teſtimony of any eye-witneſs, nor even by any inſtance of this kind in other quadrupeds properly ſo called; that is, in ſuch animals as have ſome degree of affinity with elephants; ſecondly, as the female's lying on her back can hardly be more convenient for the male, eſpecially as the vagina, according to what I am told, goes from the fore-part backwards; thirdly, it is beſides well known, that the older elephants, on account of the unwieldineſs of their bodies, chiefly ſtand when they ſleep, in order to avoid the trouble and difficulty of lying down and getting up again. Tavernier, indeed, in his third volume, informs us, that the tame females when in rut make themſelves a kind of bed, and lay themſelves in it on their backs, at the ſame time inviting the male elephant by a peculiar cry, &c. but as the author did not ſee this himſelf, and that beſides it is entirely contrary to the modeſty and diſlike to copulation for which the female elephants have always been remarked, I cannot do otherwiſe than leave M. Tavernier's relation and different opinions touching the ſubject to the teſt of future experience."

Mr J. C. Wolf, however, in his Voyage to Ceylon lately publiſhed, confirms the common opinion, and gives an account of the operation in queſtion as if he had more than once ſeen it performed. "The male (he informs us) makes a pit or hollow in the ground, and aſſiſts his conſort to lay herſelf on her back; and in caſe he finds her perfectly compliant and agreeable, very complaiſantly helps her up again after the buſineſs is finiſhed (for ſhe cannot poſſibly riſe of herſelf), by throwing his trunk round her neck: but if ſhe at firſt ſtood ſhilly-ſhally, and gave herſelf prudiſh airs, he then even lets her lie, and goes about his buſineſs." But concerning the credit due to this author, the public ſeem not to be agreed. On the other hand, M. Buffon, in his Supplement, has retracted his former opinion, upon the authority of M. Bles (ſecretary during 12 years to the Dutch government in Ceylon); who deſcribes the copulation of theſe animals in the ſame manner as Farmer Kok does in the extract above given from Dr Sparrman. "Having perceived (ſays M. Bles) that the Count de Buffon, in his excellent work, is deceived with regard to the copulation of the elephants, I know, that in ſeveral parts of Aſia and Africa theſe animals, eſpecially during the ſeaſon of love, remain almoſt in the moſt inacceſſible places of the foreſts; but in the iſland of Ceylon, where I lived 12 years, the land being every where inhabited, they cannot ſo eaſily conceal themſelves; and having often examined them, I perceived that the female organ is ſituated nearly under the middle of the belly, which would lead us to think, with M. Buffon, that the males cannot cover the females in the manner of other quadrupeds. However, there is only a ſlight difference of ſituation. When they inclined to copulate, I perceived that the female bowed down her head and neck, and leaned her two fore-legs, which were alſo bended, upon the root of a tree, as if ſhe meant to proſtrate herſelf on the ground; and the two hind-legs remained erect, which gave the male an opportunity of embracing her as other quadrupeds do. I can likewiſe affirm, that the females go with young about nine months. Moreover, the elephants never copulate unleſs when in a ſtate of freedom. In the ſeaſon of love, the males are ſtrongly chained for four or five weeks, during which time they diſcharge vaſt quantities of ſemen, and are ſo furious, that their cornacks or governors cannot come near them without danger. The approach of the rutting ſeaſon is eaſily known; for ſome days before it happens, an oily liquor flows from a ſmall hole on each ſide of the head. The domeſtic female on theſe occaſions ſometimes makes her eſcape, and joins the wild males in the woods. Some days afterward, her cornack goes in queſt of her, and calls her by her name till ſhe comes. She ſubmits to him with complacence, and allows herſelf to be conducted home, and ſhut up in the ſtable. It was from caſes of this kind that it was diſcovered that the females bring forth about the end of nine months."—The firſt remark, with regard to the mode of copulating, M. Buffon thinks unqueſtionable, ſince M. Marcel Bles aſſures us that he has ſeen the elephants perform the operation. But as to the time of geſtation, which he limits to nine months, we ought to ſupend our judgment, becauſe all travellers affirm that the female elephant is believed to go with young no leſs than two years.

Elephants, even in a ſavage ſtate, are peaceable and gentle creatures. They never uſe their weapons but in defence of themſelves or companions. Their ſocial diſpoſitions are ſo ſtrong, that they are ſeldom found alone, but march always in large troops: the oldeſt and moſt experienced lead the van; the younger, or lame ones, keep in the middle; and thoſe of a ſecond rate, as to age, walk in the rear. The females carry their young on their tuſks, embracing them at the ſame time with their trunk. They ſeldom march in this regular order but when they reckon the journey dangerous, ſuch as an expedition to cultivated lands, where they expect to meet with reſiſtance. On other occaſions they are leſs cautious; ſome of them falling behind or ſeparating from the reſt, but ſeldom ſo far as to be without the reach of aſſiſtance by alarming and aſſembling their companions. It is dangerous to offer them the leaſt injury; for they run ſtraight upon the offender; and although the weight of their body be great, their ſteps are ſo large, that they eaſily outrun the ſwifteſt man, whom they either pierce with their tuſks, or ſeize with their trunk, dart him in the air like a ſtone, and then trample him under their feet. But they never attack any perſon unleſs when provoked. However, as they are extremely ſenſible and delicate with regard to injuries, it is always prudent to keep out of their way. Travellers who frequent theſe countries kindle large fires, and beat drums during the night, in order to prevent their approach. After being once attacked by men, or falling into any ambuſh, they are ſaid never to forget the injury, but ſearch for every opportunity of getting revenge. As they are endowed perhaps with a more exquiſite ſenſation of ſmell than any other animal, owing to the great extent of their noſe, they can ſcent a man at a very great diſtance, and trace him by his footſteps.

Elephants are peculiarly fond of the banks of rivers, deep valleys, and marſhy grounds, eſpecially when well ſhaded with trees. They delight in drawing up water into their trunks, even when they do not drink it, and amuſe themſelves in daſhing the water around. They cannot endure cold, and are equally averſe to an exceſs of heat: in order to avoid the ſcorching heat of the ſun, they retire to the thickeſt and moſt ſhady parts of the foreſt. The bulk of their bodies is ſo enormous, that they do not chooſe to go into deep waters ſo frequently as ſome other quadrupeds; although the length of their trunk, which they raiſe ſtraight up, and by which they reſpire, is a great advantage in ſwimming.

The ordinary food of elephants is roots, herbs, leaves, the tender branches of trees, fruits, and grains: but they abhor fleſh or fiſh. When any of them diſcovers a fine paſture, he immediately calls and invites his companions to come and eat with him. As they devour a large quantity of food in a ſhort time, they are always ſhifting their paſture; when they meet with cultivated grounds, they make a prodigious deſolation, and deſtroy more plants by their feet than they uſe for nouriſhment: which laſt is very conſiderable, amounting to 150 pounds of herbage every day: by this means, as they conſtantly graze in large troops, they lay waſte whole fields in an hour. The Indians and negroes employ every art to prevent them from viſiting their cultivated lands, making great noiſes, and burning large fires round their fields. However, theſe precautions are not always ſufficient to prevent the elephants from viſiting them. They chaſe away the domeſtic animals, put the men to flight, and ſometimes even throw down their timber huts. Elephants are hardly ſuſceptible of fear: the only things which can ſurpriſe them or ſtop their courſe are artificial fires, ſuch as ſquibs, crackers, &c. the effects of which are ſo ſudden and ſo quickly repeated, that the elephants frequently turn back; and when one runs, all the reſt inſtantly follow his example.

Although the ſocial diſpoſition in the elephant be exceeding ſtrong; yet whenever the females come in ſeaſon, it immediately gives place to the ſtronger and more intereſting paſſion of love. They obſerve the greateſt delicacy in their amours, abhorring nothing ſo much as to be ſeen by their companions. The troop divide themſelves into couples, ſteal off into the moſt ſecret places of the foreſt, and then give way to all the impulſes of nature, which are lively and laſting in proportion to the long period of abſtinence; for, according to all accounts, except that of M. Bles already noticed (A), the female goes with young two years, and it is only once in three years that the ſeaſon of love returns. They bring forth but one at a time; which, as ſoon as it comes into the world, is as large as a wild boar, and is furniſhed with teeth: however, the large tuſks do not make their appearance till ſome time after, and at the age of ſix months they are ſeveral inches long. Elephants of this age are as large as an ox when in a natural ſtate.

The manner of taking and taming elephants, therefore, merits our attention. In foreſts and ſuch places as are frequented by elephants, the Indians chooſe a ſpot and incloſe it with ſtrong palliſades; they uſe the largeſt trees as the principal ſtakes, to which are fixed ſmaller ones in a tranſverſe direction. Theſe croſs trees are fixed ſo as to allow a man to paſs eaſily through. There is likewiſe a large port left for the elephant, over which is ſuſpended a ſtrong barrier, which is let down as ſoon as he enters. In order to decoy him into the incloſure, the hunters take along with them a tame female in ſeaſon, and travel about till they come ſo near as that the cry of the female can reach a male, whom they previouſly obſerve in the foreſt; then the guide of the female makes her give the cry peculiar to the ſeaſon of love: the male inſtantly replies, and ſets out in queſt of her. The guide then makes the female proceed towards the artificial incloſure, repeating her cries from time to time as ſhe goes along. She enters into

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(A) Mr Bles's information is adopted by Mr Pennant: That they go only nine months with young, he ſays, is gueſſed by the caſual eſcape of the tame females, when in rut, into the woods; where they couple with the wild; are ſoon diſcovered and brought back, and obſerved to bring forth in about nine months from the time.

Elephas.

into the incloſure, the male follows her, and the Indians immediately ſhut the port behind him. He no ſooner diſcovers the hunters, and that he is incloſed, than his paſſion for the ſex is converted into rage and fury. The hunters entangle him with ſtrong ropes; they fetter his legs and trunk; they bring two or three tame elephants in order to pacify and reconcile him to his condition. In a word, they reduce him to obedience in a few days, by a proper application of torture and careſſes. There are many other methods of catching elephants. Inſtead of making large incloſures with palliſades, like the kings of Siam, and other monarchs, the poor Indians content themſelves with a very ſimple apparatus: they dig deep pits in the roads frequented by elephants, covering them over with branches of trees, turf, &c. When an elephant falls into one of theſe pits, he is unable to get out again.

The elephant, when tamed, is the moſt friendly and obedient of all animals: he is entirely attached to the perſon who feeds and takes care of him. In a ſhort time he underſtands ſigns, and the ſound of his maſter's voice. He diſtinguiſhes the language of paſſion, of command, of ſatisfaction; and acts accordingly. He receives his orders with attention, and executes them with prudence and alacrity, but without precipitation. He eaſily learns to bow his knees and lower his body, for the convenience of thoſe who mount him. He careſſes his friends with his trunk. He lifts burdens with his trunk, and aſſiſts thoſe who are loading him in laying them on his back. He delights in ſhining harneſs and trappings. When yoked in a cart or waggon, he pulls equally and cheerfully, unleſs he be abuſed by injudicious chaſtiſements. His guide is generally mounted on his neck, with a ſmall rod of iron ſharp at the point in his hand; he directs his motion by pricking him on the ears and head; but, for the moſt part, a word is ſufficient.

A tame elephant will do more labour than ſix horſes; but then he requires a proportional quantity of food. They are the principal beaſts of burden in many parts of Africa and the Eaſt Indies. They carry ſacks and bundles of all kinds on their neck, back, and tuſks. They never loſe or damage any thing committed to their care: they will ſtand on the edge of a river, take bundles off their necks and tuſks, lay them carefully in a boat wherever they are deſired, and try with their trunk whether they are properly ſituated; if they be loaded with caſks, they go in queſt of ſtones to prop them and prevent them from rolling.

The elephant is not only the moſt tractable, but the moſt intelligent, of animals; ſenſible of benefits, reſentful of injuries, and endowed even with a ſenſe of glory.—In India, they were once employed in the launching of ſhips: one was directed to force a very large veſſel into the water; the work proved ſuperior to his ſtrength: his maſter, with a ſarcaſtic tone, bid the keeper take away this lazy beaſt and bring another: the poor animal inſtantly repeated his efforts, fractured his ſkull, and died on the ſpot. In Delli, an elephant paſſing along the ſtreets, put his trunk into a taylor's ſhop, where ſeveral people were at work: one of them pricked the end with his needle: the beaſt paſſed on; but in the next dirty puddle filled his trunk with water, returned to the ſhop, and ſpurting every drop among the people who had offended him, ſpoilt their work.

Ludolph. com in hiſt. Æthiop. p. 147.

Ibid.

An elephant in Adſmeer, which often paſſed thro' the bazar or market, as he went by a certain herbwoman, always received from her a mouthful of greens: at length he was ſeized with one of his periodical fits of rage, broke his fetters, and, running through the market, put the crowd to flight; among others, this woman, who in haſte forgot a little child ſhe had brought with her. The animal recollecting the ſpot where his benefactreſs was wont to ſit, took up the infant gently in his trunk, and placed it in ſafety on a ſtall before a neighbouring houſe. Another, in his madneſs, killed his *cornac* or governor: the wife ſeeing the misfortune, took her two children and flung them before the elephant, ſaying, "Now you have deſtroyed their father, you may as well put an end to their lives and mine." It inſtantly ſtopped. relented, took the greateſt of the children, placed him on its neck, adopted him for his *cornac*, and never afterwards would permit any body elſe to mount it.

Buffon, p. 78.

A ſoldier at Pondicherry, who was accuſtomed, whenever he received the portion that came to his ſhare, to carry a certain quantity of it to one of theſe animals, having one day drank rather too freely, and finding himſelf purſued by the guards, who were going to take him to priſon, took refuge under the elephant's body and fell aſleep. In vain did the guard try to force him from this aſylum, as the elephant protected him with his trunk. The next morning the ſoldier, recovering from his drunken fit, ſhuddered with horror to find himſelf ſtretched under the belly of this huge animal. The elephant, which without doubt perceived the man's embarraſſment, careſſed him with his trunk, in order to inſpire him with courage and make him underſtand that he might now depart in ſafety.

Mem. p ſervir a l'Hiſt. nimau par M ſieurs de l'Acad Sciences, Part II.

A painter was deſirous of drawing the elephant which was kept in the menagerie at Verſailles in an uncommon attitude, which was that of holding his trunk raiſed up in the air with his mouth open. The painter's boy, in order to keep the animal in this poſture, threw fruit into his mouth; but as the lad frequently deceived him, and made an offer only of throwing him the fruit, he grew angry; and. as if he had known that the painter's intention of drawing him was the cauſe of the affront that was offered him, inſtead of revenging himſelf on the lad, he turned his reſentment on the maſter, and taking up a quantity of water in his trunk, threw it on the paper on which the painter was drawing, and ſpoiled it.

Voyage la Caill p. 160.

At the Cape of Good Hope, it is cuſtomary to kill thoſe animals, for the ſake of their teeth, by the chaſe. Three horſemen, well mounted and armed with lances, attack the elephant alternately, each relieving the other as they ſee their companion preſſed, till the beaſt is ſubdued. Three Dutchmen (brothers), who had made large fortunes by this buſineſs, determined to retire to Europe, and enjoy the fruits of their labours; but reſolved, before they went, to have a laſt chaſe by way of amuſement: they met with their game, and began the attack in the uſual manner; but unfortunately one of their horſes fell down and flung its rider: the enraged animal inſtantly ſeized the unhappy man with its trunk, flung him up to a vaſt height in the air, and received

ceived him on one of its tuſks; then turning towards the two other brethren, as if it were with an aſpect of revenge and inſult, held out to them the impaled wretch writhing on the bloody tooth.

From the earlieſt accounts in hiſtory, the eaſtern nations have employed elephants in war; Alexander the Great was the firſt European who ever mounted an elephant. He carried a number of them into Greece, which Pyrrhus employed ſome years after againſt the Romans at the battle of Tarentum. Both the Greeks and Romans ſoon learnt to get the better of thoſe monſtrous animals: they opened their ranks and allowed them to paſs through; neither did they attempt to hurt them, but threw darts, &c. at their guides. Now that fire-arms are the principal inſtruments of war, elephants, who are terrified at the noiſe and flame, inſtead of being uſeful, would only tend to embarraſs and confuſe an army. However, in Cochin and other parts of Malabar, as alſo in Tonquin, Siam, and Pegu, where fire-arms are little underſtood, they are ſtill uſed in battle. The guide ſits aſtride upon the neck, and the combatants ſit or ſtand upon the other parts of the body. They are alſo extremely ſerviceable in fording of rivers, and carrying over the baggage on their backs. After the keepers have loaded them with ſeveral hundred weight, they faſten ropes to them; of which the ſoldiers taking hold, either ſwim or are drawn acroſs the river. In time of action, they now and then fix an heavy iron chain to the end of their trunks, which they whirl round with ſuch agility, as to make it impoſſible for an enemy to approach them at that time. Another uſe they ſtill have for this creature in war, is to force open the gates of a city or garriſon which is cloſely beſieged. This he does by ſetting his backſide againſt them, riggling backwards and forwards with his whole weight, till he has burſt the bars, and forced an entrance: to prevent which, moſt of the garriſons in this country have large ſpikes ſtuck in their gates, that project to a conſiderable diſtance. However, after all, thoſe prodigious animals are kept more for ſhow and grandeur than for uſe, and their keeping is attended with a very great expence, for they devour vaſt quantities of proviſion; and you muſt ſometimes regale them with a plentiful repaſt of cinnamon, of which they are exceſſively fond. It is ſaid to be no uncommon thing with a Nabob, if he has a mind to ruin a private gentleman, to make him a preſent of an elephant, which he is ever afterwards obliged to maintain at a greater expence than he can afford: by parting with it, he would certainly fall under the diſpleaſure of the grandee, beſides forfeiting all the honour which his countrymen think is conferred upon him by ſo reſpectable a preſent.

When the elephant is properly managed, he lives very long even in a ſtate of ſlavery and labour. That ſome have lived in this ſtate 130 years, is pretty well authenticated. In a natural ſtate, they often exceed 200 years, and propagate their ſpecies till they are 120: It is 30 years before they come to their full growth.

The elephant inhabits India, and ſome of its greater iſlands, Cochin China, and ſome of the provinces of China. It abounds in the ſouthern parts of Africa, from the river Senegal to the Cape; and from thence as high as Ethiopia on the other ſide. They are found in the greateſt numbers in the interior parts, where there are vaſt foreſts, near the ſides of rivers. The wild elephants of Ceylon live in troops or families diſtinct and ſeparate from all others, and ſeem to avoid the ſtrange herds with particular care. When a family removes from place to place, the largeſt-tuſked males put themſelves at the head; and if they meet with a large river, are the firſt to paſs it. On arriving on the oppoſite bank, they try whether the landing-place is ſafe: in caſe it is, they give a ſignal of a note from the trunk, as if it were the ſound of a trumpet, on which the remaining part of the old elephants ſwim over; the little elephants follow, holding one another by locking their trunks together; and the reſt of the old ones bring up the rear. In the woods are often ſeen a ſolitary male elephant, wandering like an outlaw baniſhed from the herd and all the race. Theſe are as if in a ſtate of deſperation, and very dangerous. A ſingle man will put to flight whole herds of ſocial elephants: this alone fears not his preſence, but will ſtand firm, putting his power to defiance. Elephants are not at preſent domeſticated in Africa, but only in the more civilized parts of Aſia. They are much more numerous in Africa. In ſome parts they ſwarm ſo, that the negroes are obliged to make their habitations under ground for fear of them. They are killed and eaten by the natives, and the trunk is ſaid to be a delicious morſel. All the teeth are brought from Africa: they are frequently picked up in the woods; ſo that it is uncertain whether they are ſhed teeth, or thoſe of dead animals. The African teeth which come from Moſambique are ten feet long; thoſe of Malabar only three or four; the largeſt in Aſia are thoſe of Cochin China, which even exceed the ſize of the elephants of Moſambique. The ſkin is thick, and, when dreſſed, proof againſt a muſket ball. The fleſh, the gall, the ſkin, and the bones, are ſaid to be uſed medicinally by the Chineſe. See Plate CLXXX.

ELEVATION, the ſame with ALTITUDE or height.

*Elevation of the Hoſt*, in the church of Rome, that part of the maſs where the prieſt raiſes the hoſt above his head for the people to adore.

ELEVATOR, in anatomy, the name of ſeveral muſcles, ſo called from their ſerving to raiſe the parts of the body to which they belong.

ELEVATORY, in ſurgery, an inſtrument for raiſing depreſſed or fractured parts of the ſkull, to be applied after the integuments and perioſteum are removed. See SURGERY.

ELEVE, a term purely French, though of late uſed alſo in our language. Literally it ſignifies a diſciple or ſcholar bred up under any one, being formed from the Italian *allievo*, an "apprentice" or "novice."

It was firſt uſed by the French writers in ſpeaking of painters; ſuch a painter was an eleve of Da Vinci, of Raphael, &c. From painting it came to be applied to ſuch as ſtudied or learned any other art under a maſter. In the Royal Academy of Sciences, there were 20 eleves: and in that of inſcriptions, 10 eleves. The eleves are to act in concert with the penſionaries. See ACADEMY.

The denomination *eleve*, however, has been ſince ſuppreſſed, and that of *adjoint* ſubſtituted in its room; becauſe every body did not know the ſenſe affixed to it by the academy: and now the penſionary academiſts have not, as formerly, each of them an eleve; but the eleves

eleves are become adjoints, or aſſociates of the academy.

ELEVENTH, or chord of the eleventh. See INTERVAL.

ELEUSINIA, in Grecian antiquity, a feſtival kept in honour of Ceres, every fourth year by ſome ſtates, but by others every fifth. The Athenians celebrated it at Eleuſis, a town of Attica; whence the name.

Ceres, ſays an Athenian orator (Iſocrates), wandering in queſt of her daughter Proſerpine, came into Attica, where ſome good offices were done her, which it is unlawful for thoſe who are not initiated to hear. In return ſhe conferred two unparalleled benefits; to wit, the knowledge of agriculture, by which the human race is raiſed above the brute creation; and the myſteries, from which the partakers derive ſweeter hopes than other men enjoy, both as to the preſent life and to eternity. It was the popular opinion, that the Eleuſinian goddeſſes ſuggeſted prudent counſel to their votaries, and influenced their conduct; that theſe were reſpected in the infernal regions, and had precedence in the aſſemblies of the bleſſed; while the unhallowed were in utter darkneſs, wallowing in mire, or labouring to fill a leaky veſſel. The Athenians were ſolicitous to ſecure theſe advantages to their children, by having them initiated as ſoon as was allowed.

Ceres was ſuppoſed to be particularly partial to Eleuſis and its vicinity. *There* were the memorials of her preſence and of her bounty; the well-named *Callichorus*, by which ſhe had reſted, in the reign of Erectheus; the ſtone on which ſhe ſat, named *the ſorrowful;* the Rharian plain, where barley was firſt ſown; and the threſhing-floor and altar of Triptolemus, a herdſman whom ſhe inſtructed in the culture of that grain, the uſe of which ſucceeded to acorns. Her myſteries continued to poſſeſs a pre-eminence in holineſs, and to be accounted as much ſuperior to all other religious feſtivals as the gods were to the heroes. Even the garments worn at the ſolemnity were ſuppoſed to partake of their efficacy, and to be endued with ſignal virtues. It was uſual to retain them until they were periſhing; and then to dedicate them in the temple, or to reſerve them for the purpoſe of enwrapping new-born children.

The myſtic temple, as it was called, provided by Pericles for the ſolemnity, created ſuch awe by its ſanctity as could be equalled only by the effect of its beauty and magnitude, which excited aſtoniſhment in every beholder. The profane or uninitiated were forbidden to enter it on any pretence. Two young Acarnanians happened inadvertently to mix with the croud at the ſeaſon of the myſteries, and to go in; but the queſtion ſuggeſted by their ignorance preſently betrayed them, and their intruſion was puniſhed with death. The chief prieſt, hierophant, or myſtagogue, was taken from the Eumolpidæ, a holy family flouriſhing at Athens, and deſcended from Eumolpus, a ſhepherd and favourite of Ceres. He was enjoined celibacy, and wore a ſtole or long garment, his hair, and a wreath of myrtle. The grand requiſites in his character were ſtrength and melody of voice, ſolemnity of deportment, magnificence, and great decorum. Under him, beſides many of inferior ſtation, was the daduchus or torch-bearer, who had likewiſe his hair, with a fillet; the prieſt, who officiated at the altar; and the hiero-ceryx or ſacred herald; all very important perſonages. The latter was of a family which claimed the god Mercury and Aglauros the daughter of Cecrops for its anceſtors.

The ſecrecy in which the myſteries were enveloped, ſerved to enhance the idea of their conſequence, and to increaſe the deſire of participation. It was ſo particular, that no perſon was allowed even to name the hierophant by whom he had been initiated. Public abhorrence and deteſtation awaited the babbler, and the law directed he ſhould die.

The Athenians ſuffered none to be initiated into theſe myſteries but ſuch as were members of their city. This regulation, which compelled Hercules, Caſtor, and Pollux, to become citizens of Athens, was ſtrictly obſerved in the firſt ages of the inſtitution, but afterwards all perſons, barbarians excepted, were freely initiated.

The feſtivals were divided into great and leſs myſteries. The leſs were inſtituted from the following circumſtance. Hercules paſſed near Eleuſis while the Athenians were celebrating the myſteries, and deſired to be initiated. As this could not be done, becauſe he was a ſtranger, and as Eumolpus was unwilling to diſpleaſe him on account of his great power, and the ſervices which he had done to the Athenians, another feſtival was inſtituted without violating the laws. It was called μικρα, and Hercules was ſolemnly admitted to the celebration and initiated. Theſe leſs myſteries were obſerved at Agræ near the Iliſſus. The greater were celebrated at Eleuſis, from which place Ceres has been called *Eleuſinia*. In later times the ſmaller feſtivals were preparatory to the greater, and no perſon could be initiated at Eleuſis without a previous purification at Agræ. This purification they performed by keeping themſelves pure, chaſte, and unpolluted, during nine days; after which they came and offered ſacrifices and prayers, wearing garlands of flowers, called ισμερα or ιμηρα, and having under their feet Διος κωδιον, *Jupiter's ſkin*, which was the ſkin of a victim offered to that god. The perſon who aſſiſted was called υδρανος from υδωρ *water*, which was uſed at the purification, and they themſelves were called μυσται, *the initiated.*

A year after the initiation at the leſs myſteries they ſacrificed a ſow to Ceres, and were admitted in the greater, and the ſecrets of the feſtivals were ſolemnly revealed to them, from which they were called εφοροι and εποπται, *inſpectators.*

This feſtival was obſerved in the month Boedromion or September, and continued nine days from the 15th till the 23d. During that time it was unlawful to arreſt any man or preſent any petition, on pain of forfeiting a thouſand drachmas, or according to others on pain of death. It was alſo unlawful for thoſe who were initiated to ſit upon the cover of a well, to eat beans, mullets, or weazels. If any woman rode to Eleuſis in a chariot, ſhe was obliged by an edict of Lycurgus to pay 6,000 drachmas. The deſign of this law was to deſtroy all diſtinction between the richer and poorer ſort of citizens. When the ſeaſon approached, the myſtæ or perſons who had been initiated only in the leſſer myſteries, repaired to Eleuſis to be inſtructed in the ceremonial. The ſervice for the opening of the temple, with morning ſacrifice, was performed

formed. The ritual was then produced from the ſanctuary. It was enveloped in ſymbolical figures of animals, which ſuggeſted words compendiouſly, in letters with ligatures, implicated, the tops huddled together, or diſpoſed circularly like a wheel; the whole utterly inexplicable to the profane. The caſe, which was called *Petroma*, conſiſted of two ſtones exactly fitted. The myſterious record was replaced after the reading, and cloſed up until a future feſtival. The principal rite was nocturnal, and confined to the temple and its environs. The myſtæ waited without, with impatience and apprehenſion. Lamentations and ſtrange noiſes were heard. It thundered. Flaſhes of light and of fire rendered the deep ſucceeding darkneſs more terrible. They were beaten, and perceived not the hand. They beheld frightful apparitions, monſters, and phantoms of a canine form. They were filled with terror, became perplexed and unable to ſtir. The ſcene then ſuddenly changed to brilliant and agreeable. The propylæa or veſtibules of the temple were opened, the curtains withdrawn, the hidden things diſplayed. They were introduced by the hierophant and daduchus, and the former ſhowed them the myſteries. The ſplendor of illumination, the glory of the temple and of the images, the ſinging and dancing which accompanied the exhibition, all contributed to ſooth the mind after its late agitation, and to render the wondering devotee tranquil and ſelf-fatisfied. After this inſpection, or, as it was called, the *autopſia*, they retired, and others advanced. The ſucceeding days were employed in purification, in ſacrifice, in pompous proceſſions, and ſpectacles, at which they aſſiſted, wearing myrtle-crowns. The ſecond day was called αλαδε μυσται, *to the ſea, you that are initiated*; becauſe they were commanded to purify themſelves by bathing in the ſea. On the third day ſacrifices, and chiefly a mullet, were offered; as alſo barley from a field of Eleuſis. Theſe oblations were called Θυα, and held ſo ſacred that the prieſts themſelves were not, as in other ſacrifices, permitted to partake of them. On the fourth day they made a ſolemn proceſſion, in which the καλαθιον, *holy baſket of Ceres* was carried about in a conſecrated cart, while on every ſide the people ſhouted χαιρε Δημητερ, *Hail, Ceres!* After theſe followed women, called κιστοφοροι, who *carried baſkets*, in which was ſeſamin, carded wool, grains of ſalt, a ſerpent, pomegranates, reeds, ivy boughs, certain cakes, &c. The fifth was called Ἡ των λαμπαδων ημερα, *the torch day*; becauſe on the following night the people ran about with torches in their hands. It was uſual to dedicate torches to Ceres, and contend which ſhould offer the biggeſt, in commemoration of the travels of the goddeſs, and of her lighting a torch in the flames of mount Ætna. The ſixth day was called Ιακχος, from Iacchus, the ſon of Jupiter and Ceres, who accompanied his mother in her ſearch after Proſerpine with a torch in his hand. From that circumſtance his ſtatue had a torch in his hand, and was carried in ſolemn proceſſion from the Geramicus to Eleuſis. The ſtatue with thoſe that accompanied it, called Ιακχαγωγοι, was crowned with myrtle. In the way nothing was heard but ſinging and the noiſe of brazen kettles as the votaries danced along. The way through which they iſſued from the city was called Ιερα οδος *the ſacred way*, the reſting place Ιερα συκη, from a *fig-tree* which grew in the neighbourhood. They alſo ſtopped on a bridge over the Cephiſus, where they derided thoſe that paſſed by. After they had paſſed this bridge, they entered Eleuſis by a place called μυστικη εισοδος, *the myſtical entrance*. On the ſeventh day were ſports, in which the victors were rewarded with a meaſure of barley, as that grain had been firſt ſown in Eleuſis. The eighth day was called Επιδαυριων ημερ, becauſe once Æſculapius at his return from Epidaurus to Athens was initiated by the repetition of the leſs myſteries. It became cuſtomary, therefore, to celebrate them a ſecond time upon this, that ſuch as had not hitherto been initiated might be lawfully admitted. The ninth and laſt day of the feſtival was called Πλημοχοαι *earthen veſſels*, becauſe it was uſual to fill two ſuch veſſels with wine; one of which being placed towards the eaſt, and the other towards the weſt; which, after the repetition of ſome myſtical words, were both thrown down, and the wine being ſpilt on the ground was offered as a libation.

The ſtory of Ceres and Proſerpine, the foundation of the Eleuſinian myſteries, was partly local. It was both verbally delivered, and repreſented in allegorical ſhow. Proſerpine was gathering flowers when ſhe was ſtolen by Pluto. Hence the proceſſion of the holy baſket, which was placed on a car dragged along by oxen, and followed by a train of females, ſome carrying the myſtic cheſts, ſhouting, *Hail, Ceres!* At night a proceſſion was made with lighted torches, to commemorate the goddeſs ſearching for her daughter. A meaſure of barley, the grain which, it was believed, ſhe had given, was the reward of the victors in the gymnic exerciſes; and the tranſaction at the temple had a reference to the legend. A knowledge of theſe things and places, from which the profane were excluded, was the amount of initiation; and the mode of it, which had been deviſed by craft, was ſkilfully adapted to the reigning ſuperſtitions. The operation was forcible, and the effect in proportion. The prieſthood flouriſhed as piety increaſed. The diſpenſation was corrupt, but its tendency not malignant. It produced ſanctity of manners and an attention to the ſocial duties; deſire to be as diſtinguiſhed by what was deemed virtue as by ſilence.

Some have ſuppoſed the principal rites at this feſtival to have been obſcene and abominable, and that from thence proceeded all the myſterious ſecrecy. They were carried from Eleuſis to Rome in the reign of Adrian, where they were obſerved with the ſame ceremonies as before, though perhaps with more freedom and licentiouſneſs. They laſted about 1800 years, and were at laſt aboliſhed by Theodoſius the Great.

ELEUSIS, (anc. geog.) a town in Attica between Megara and the Piræus, celebrated for the feſtivals of Ceres. See the preceding article.—Thoſe rites were finally extinguiſhed in Greece upon the invaſion of Alaric the Goth. Eleuſis, on the overthrow of its goddeſs and the ceſſation of its gainful traffic, probably became ſoon an obſcure place, without character or riches. For ſome ages, however, it was not entirely forſaken, as is evident from the vaſt conſumption of the ancient materials, and from the preſent remains, of which the following account is given by Dr Chandler †. "The port was ſmall and of a circular form. The

† *Travels in Greece*, p. 189.

Eleuſinia. ſtones of one pier are ſeen above water, and the correſponding ſide may be traced. About half a mile from the ſhore is a long hill, which divides the plain. In the ſide next the ſea are traces of a theatre, and on the top are ciſterns cut in the rock. In the way to it, ſome maſſes of wall and rubbiſh, partly ancient, are ſtanding; with ruined churches; and beyond, a long broken aqueduct croſſes to the mountains. The Chriſtian pirates had infeſted the place ſo much, that in 1676 it was abandoned. It is now a ſmall village at the eaſtern extremity of the rocky brow, on which was once a caſtle; and is inhabited by a few Albanian families, employed in the culture of the plain, and ſuperintended by a Turk, who reſides in an old ſquare tower. The proprietor was Achmet Aga, the primate or principal perſon of Athens.

"The myſtic temple at Eleuſis was planned by Ictinus, the architect of the Parthenon. Pericles was overſeer of the building. It was of the Doric order; the cell ſo large as to admit the company of a theatre. The columns on the pavement within, and their capitals, were raiſed by Coræbus. Metagenes of Xypete added the architraves and the pillars above them, which ſuſtained the roof. Another completed the edifice. This was a temple *in antis*, or without exterior columns, which would have occupied the room required for the victims. The aſpect was changed to *Proſtylos* under Demetrius the Phalerean; Philo a famous architect erecting a portico, which gave dignity to the fabric, and rendered the entrance more commodious. The ſite was beneath the brow, at the eaſt end, and encompaſſed by the fortreſs. Some marbles, which are uncommonly maſſive, and ſome pieces of the columns, remain on the ſpot. The breadth of the cell is about 150 feet; the length, including the pronaos and portico, is 216 feet; the diameter of the columns, which are fluted 6 inches from the bottom of the ſhafts, is 6 feet and more than 6 inches. The temple was a decaſtyle or had 10 columns in the front, which was to the eaſt. The peribolus or incloſure, which ſurrounded it on the north-eaſt and on the ſouth ſide, meaſures 387 feet in length from north to ſouth, and 328 feet in breadth from eaſt to weſt. On the weſt ſide it joined the angles of the weſt end of the temple in a ſtraight line. Between the weſt wall of the incloſure and temple and the wall of the citadel was a paſſage of 42 feet 6 inches wide, which led to the ſummit of a high rock at the north-weſt angle of the incloſure, on which are viſible the traces of a temple *in antis*, in length 74 feet 6 inches from north to ſouth, and in breadth from the eaſt to the wall of the citadel, to which it joined on the weſt, 54 feet. It was perhaps that ſacred to Triptolemus. This ſpot commands a very extenſive view of the plain and bay. About three-fourths of the cottages are within the precincts of the myſtic temple, and the ſquare tower ſtands on the ruined wall of the incloſure.

"At a ſmall diſtance from the north end of the incloſure is a heap of marble, conſiſting of fragments of the Doric and Ionic orders; remains, it is likely, of the temples of Diana Propylea and of Neptune, and of the Propyleum or gateway. Wheler ſaw ſome large ſtones carved with wheat-ears and bundles of poppy. Near it is the buſt of a coloſſal ſtatue of excellent workmanſhip, maimed, and the face diſfigured; the breadth at the ſhoulders, as meaſured by Pococke, 5 feet and an half; and the baſket on the head above 2 feet deep. It probably repreſented Proſerpine. In the heap are two or three inſcribed pedeſtals; and on one are a couple of torches, croſſed. We ſaw another fixed in the ſtone ſtairs, which lead up the ſquare tower on the outſide. It belonged to the ſtatue of a lady, who was hierophant or prieſteſs of Proſerpine, and had covered the altar of the goddeſs with ſilver. A well in the village was perhaps that called Callichorus, where the women of Eleuſis were accuſtomed to dance in honour of Ceres. A tradition prevails, that if the broken ſtatue be removed, the fertility of the land will ceaſe. Achmet Aga was fully poſſeſſed with this ſuperſtition, and declined permitting us to dig or meaſure there, until I had overcome his ſcruples by a preſent of a handſome ſnuff-box containing ſeveral zechins or pieces of gold."

ELEUTHERIA, a feſtival celebrated at Platæa in honour of Jupiter *Eleutherius*, or "the aſſertor of liberty," by delegates from almoſt all the cities of Greece. Its inſtitution originated in this: After the victory obtained by the Grecians under Pauſanias over Mardonius the Perſian general in the country of Platæa, an altar and ſtatue were erected to Jupiter Eleutherius, who had freed the Greeks from the tyranny of the barbarians. It was further agreed upon in a general aſſembly, by the advice of Ariſtides the Athenian, that deputies ſhould be ſent every fifth year, from the different cities of Greece, to celebrate Eleutheria, feſtivals of liberty. The Platæans celebrated alſo an anniverſary feſtival in memory of thoſe who had loſt their lives in that famous battle. The celebration was thus: At break of day a proceſſion was made with a trumpeter at the head, ſounding a ſignal for battle. After him followed chariots loaded with myrrh, garlands, and a black bull, and certain free young men, as no ſigns of ſervility were to appear during the ſolemnity, becauſe they in whoſe honour the feſtival was inſtituted had died in the defence of their country. They carried libations of wine and milk in large-eared veſſels, with jars of oil, and precious ointments. Laſt of all appeared the chief magiſtrate, who, though not permitted at other times to touch iron, or wear garments of any colour but white, yet appeared clad in purple, and taking a water-pot out of the city chamber, proceeded through the middle of the town, with a ſword in his hand, towards the ſepulchres. There he drew water from a neighbouring ſpring, and waſhed and anointed the monuments, after which he ſacrificed a bull upon a pile of wood, invoking Jupiter and infernal Mercury, and inviting to the entertainment the ſouls of thoſe happy heroes who had periſhed in the defence of their country. After this he filled a bowl with wine, ſaying, I drink to thoſe who loſt their lives in the defence of the liberties of Greece. There was alſo a feſtival of the ſame name obſerved by the Samians in honour of the god of love. Slaves alſo, when they obtained their liberty, kept a holiday, which they called *Eleutheria*.

ELF, a term now almoſt obſolete, formerly uſed to denote a fairy or hobgoblin; an imaginary being, the creature of ignorance, ſuperſtition, and craft. See FAIRY.

*Elf-Arrows*, in natural hiſtory, a name given to the flints anciently faſhioned into arrow-heads, and ſtill found foſſile in Scotland, America, and ſeveral other parts of the world: they are believed by the vulgar to be ſhot by fairies, and that cattle are ſometimes killed by them.

ELGIN, the capital of the county of Moray in Scotland, and formerly a biſhop's ſee, is ſituated on the river Loſey about ſix miles north from the Spey, in W. Long. 2. 25. N. Lat. 57. 40. Mr Pennant ſays, it is a good town, and has many of the houſes built over piazzas; but, excepting its great cattle-fairs, has little trade. It is principally remarkable for its eccleſiaſtical antiquities. The cathedral, now in ruins, has been formerly a very magnificent pile. The weſt door is very elegant and richly ornamented. The choir is very beautiful, and has a fine and light gallery running round it; and at the eaſt end are two rows of narrow windows in an excellent Gothic taſte. The chapter-houſe is an octagon; the roof ſupported by a fine ſingle column with neat carvings of coats of arms round the capital. There is ſtill a great tower on each ſide of this cathedral; but that in the centre, with the ſpire and whole roof, are fallen in; and form moſt awful fragments, mixed with the battered monuments of knights and prelates. Boethius ſays, that Duncan, who was killed by Macbeth at Inverneſs, lies buried here. The place is alſo crowded with a number of modern tomb-ſtones.—The cathedral was founded by Andrew de Moray, in 1224, on a piece of land granted by Alexander II.; and his remains were depoſited in the choir, under a tomb of blue marble, in 1244. The great tower was built principally by John Innes biſhop of this ſee, as appears by the inſcription cut on one of the great pillars: "Hic Jacet in Xto, pater et dominus, Dominus *Johannes de Innes* hujus eccleſiæ Epiſcopus;—qui hoc notabile opus incepit et per ſeptennium ædificavit." Elgin is a royal borough; and gives title of earl to the family of Bruce.

ELIAS, the prophet, memorable for having eſcaped the common cataſtrophe of mankind; being taken up alive into heaven, in a fiery chariot, about 895 B. C. See *the Bible*.

ELICHMAN (John), a native of Sileſia in the 17th century, who practiſed phyſic at Leyden, and was remarkable for underſtanding 16 languages. He ſupported an opinion, that the German and Perſian languages were derived from the ſame origin. His Latin tranſlation of the Tablet of Cebes, with the Arabic verſion and the Greek, was printed at Leyden in 1640, under the care of Salmaſius, who prefixed thereto a very ample preface.

ELIQUATION, in chemiſtry, an operation by which a more fuſible ſubſtance is ſeparated from one that is leſs ſo, by means of a heat ſufficiently intenſe to melt the former, but not the latter. Thus an allay of copper and lead may be ſeparated by a heat capable of melting the latter, but not the former.

ELIS. See ELEA.

ELIS, (anc. geog.), the capital of the diſtrict of that name in Peloponneſus, ſituated on the Peneus, which ran through it. It was the country of Phædo the philoſopher, ſcholar of Socrates, and friend of Plato; who inſcribes with his name the dialogue on the immortality of the ſoul. Pyrrho alſo was of this city, at the head of the ſect called after him *Pyrrhoniſts*.

The city of Elis owed its origin to an union of ſmall towns after the Perſian war. It was not encompaſſed immediately with a wall; for it had the care of the temple at Olympia, and its territory was ſolemnly conſecrated to Jupiter. To invade or not protect it was deemed impiety; and armies, if marching through, delivered up their weapons, which, on their quitting it, were reſtored. Amid warring ſtates the city enjoyed repoſe, was reſorted to by ſtrangers, and flouriſhed. The region round about it was called *cœle* or *hollow*, from the inequalities. The country was reckoned fertile, and particularly fit for the raiſing of flax. This, which grew no where elſe in Greece, equalled the produce of Judæa in fineneſs, but was not ſo yellow. Elis was a ſchool, as it were, for Olympia, which was diſtant 37 miles. The athletic exerciſes were performed there, before the more ſolemn trial, in a gymnaſium, by which the Peneus ran. The hellanodics or præfects of the games paired the rival combatants by lot, in an area called *Plethrium* or *The Acre*. Within the wall grew lofty plane-trees; and in the court, which was called the *Xyſtus*, were ſeparate courſes marked for the foot-races. A ſmaller court was called the *Quadrangle*. The præfects, when choſen, reſided for 10 months in a building erected for their uſe, to be inſtructed in the duties of their office. They attended before ſun-riſe to preſide at the races; and again at noon, the time appointed for the pentathlum or five ſports. The horſes were trained in the agora or market-place, which was called the *Hippodrome*. In the gymnaſium were altars and a cenotaph of Achilles. The women, beſides other rites, beat their boſoms in honour of this hero, on a fixed day toward ſunſet. There alſo was the town-hall, in which extemporary harangues were ſpoken and compoſitions recited. It was hung round with bucklers for ornaments. A way led from it to the baths through the Street of Silence; and another to the market-place, which was planned with ſtreets between porticoes of the Doric order adorned with altars and images. Among the temples one had a circular periſtyle or colonnade; but the image had been removed and the roof was fallen in the time of Pauſanias. The theatre was ancient, as was alſo a temple of Bacchus, one of the deities principally adored at Elis. Minerva had a temple in the citadel, with an image of ivory and gold made (it was ſaid) by Phidias. At the gate leading to Olympia was the monument of a perſon, who was buried, as an oracle had commanded, neither within nor without the city. The ſtructures of Elis, Dr Chandler obſerves, ſeem to have been raiſed with materials far leſs elegant and durable than the produce of the Ionian and Attic quarries. The ruins are of brick, and not conſiderable, conſiſting of pieces of ordinary wall, and an octagon building with niches, which, it is ſuppoſed, was the temple with a circular periſtyle. Theſe ſtand detached from each other, ranging in a vale ſouthward from the wide bed of the river Peneus; which, by the margin, has ſeveral large ſtones, perhaps reliques of the gymnaſium. The citadel was on a hill, which has on the top ſome remnants of wall.

ELISHA the prophet, famous for the miracles he performed, died about 830 B. C. See *the Bible*.

ELISION, in grammar, the cutting off or ſuppreſſing a vowel at the end of a word, for the ſake of ſound or meaſure, the next word beginning with a vowel.

Eliſions are pretty frequently met with in Engliſh poetry, but more frequently in the Latin, French, &c. They chiefly conſiſt in ſuppreſſions of the *a*, *e*, and *i*, though an eliſion ſuppreſſes any of the other vowels.

ELIXATION, in pharmacy, the extracting the virtues of ingredients by boiling or ſtewing.

ELIXIR, in medicine, a compound tincture extracted from many efficacious ingredients. Hence the difference between a tincture and an elixir ſeems to be this, that a tincture is drawn from one ingredient, ſometimes with an addition of another to open it and to diſpoſe it to yield to the menſtruum; whereas an elixir is a tincture extracted from ſeveral ingredients at the ſame time.

ELIZABETH, queen of England, daughter of Harry VIII. and Anna Boleyn, was born at Greenwich, September 7th, 1533. According to the humour of the times, ſhe was early inſtructed in the learned languages, firſt by Grindal, who died when ſhe was about 17, and afterwards by the celebrated Roger Aſcham. She acquired likewiſe conſiderable knowledge of the Italian, Spaniſh, and French languages. Dr Grindal was alſo her preceptor in divinity, which ſhe is ſaid to have ſtudied with uncommon application and induſtry. That Elizabeth became a Proteſtant, and her ſiſter Mary a Papiſt, was the effect of that cauſe which determines the religion of all mankind; namely, the opinion of thoſeby whom they were educated: and this difference of opinion, in their tutors, is not at all ſurpriſing, when we recollect, that their father Harry was of both religions, or of neither.

But the ſtudies of Elizabeth were not confined merely to languages and theology: ſhe was alſo inſtructed in the political hiſtory of the ancients; and was ſo well ſkilled in muſic, as to ſing and play "artfully and ſweetly."

After the ſhort reign of her brother Edward, our heroine being then about 20 years of age, her *firebrand* ſiſter acceding to the crown, Elizabeth experienced a conſiderable degree of perſecution, ſo as to be not a little apprehenſive of a violent death. She was accuſed of nobody knows what; impriſoned; and, we are told, inhumanly treated. At laſt, by the interceſſion of king Philip of Spain, ſhe was ſet at liberty; which ſhe continued to enjoy till, on the death of her *pious* ſiſter, ſhe, on the 17th of November 1558, aſcended the throne of England. Her political hiſtory as a queen, is univerſally known and admired *: but her attention to the government of her kingdom did not totally ſuſpend her purſuit of learning. Aſcham, in his *Schoolmaſter*, tells us, that, about the year 1563, five years after her acceſſion, ſhe being then at Windſor, beſides her perfect readineſs in Latin, Italian, French, and Spaniſh, ſhe read more Greek in one day than ſome prebendaries of that church did read Latin in a whole week, (p. 21.)—She employed Sir John Forteſcue to read to her, Thucydides, Xenophon, Polybius, Euripides, Æſchines, and Sophocles. (*Ballard*, p. 219.)—That the Latin language was familiar to her, is evident from her ſpeech to the univerſity of Oxford, when ſhe was near ſixty; alſo from her ſpirited anſwer to the Poliſh ambaſſador in the year 1598. And that ſhe was alſo ſkilled in the art of poetry appears, not only from the ſeveral ſcraps which have been preſerved, but likewiſe from the teſtimony of a cotemporary writer, Puttenham, in his *Art of Engl. Poetry* (a very ſcarce book). Theſe are his words:—"But, laſt in recital, "and firſt in degree, is the queen, whoſe learned, de-"licate, noble muſe, eaſily ſurmounteth all the reſt, "for ſenſe, ſweetneſs, or ſubtilty, be it in ode, ele-"gy, epigram, or any other kind of poem," &c. In this author are to be found only a ſpecimen of 16 verſes of her Engliſh poetry. "But," ſays Mr Walpole, "a greater inſtance of her genius, and that too in "Latin, was her extempore reply to an inſolent pro-"hibition delivered to her from Philip II. by his am-"baſſador, in this tetraſtic.

Te veto ne pergas bello defendere Belgas:
Quæ Dracus eripuit, nunc reſtituantur oportet:
Quas pater evertit, jubeo te condere cellas:
Religio papæ fac reſtituatur ad unguem.

"She inſtantly anſwered him, with as much ſpirit "as ſhe uſed to return his invaſions,"

Ad Græcas, bone rex, fient mandata kalendas.

Being earneſtly preſſed by a Romiſh prieſt, during his perſecution, to declare her opinion concerning the real preſence of Chriſt's body in the wafer, ſhe anſwered,

Chriſt was the word that ſpake it;
He took the bread, and brake it;
And what that word did make it,
That I believe, and take it.

*Fuller's Holy State.*

She gave the characters of four knights of Notttinghamſhire in the following diſtich:

Gervaſe the gentle, Stanhope the ſtout,
Markham the lion, and Sutton the lout.

*Walp. Cat.*

Coming into a grammar-ſchool, ſhe characteriſed three claſſic authors in this hexameter:

Perſius a crab-ſtaff; bawdy Martial; Ovid a fine wag.

*Full. Worth. of Warw.* 126.

Sir Walter Raleigh having wrote on a window,

Fain would I climb, yet fear I to fall;

She immediately wrote under it,

If thy heart fail thee, climb not at all.

*Worth. of Devonſh.* 261.

Doubtleſs, ſhe was a woman of ſingular capacity and extraordinary acquirements: and, if we could forget the ſtory of the Scottiſh Mary, and of her favourite Eſſex, together with the burning of a few Anabaptiſts; in ſhort, could we forbear to contemplate her character through the medium of religion and morality, we might pronounce her the moſt illuſtrious of illuſtrious women. See further, the articles England, Mary, and Scotland. She died in her palace at Richmond, the 24th of March 1602, aged 70, having reigned 44 years; and was interred in the chapel of Henry VII. in Weſtminſter Abbey. Her ſucceſſor James erected a magnificent monument to her memory.—She wrote, 1. The Mirrour, or Glaſs of the Sinful Soul. This was tranſlated out of French verſe into

* See (Hiſtory of) *England.*

Engliſh proſe, when ſhe was eleven years old. It was dedicated to queen Catherine Parr. Probably it was never printed; but the dedication and preface are preſerved in the *Sylloge epiſtolarum*, in Hearne's edition of *Livii Foro-Julienſis*, p. 161. 2. Prayers and Meditations, &c. Dedicated to her father, dated at Hatfield, 1545. Manuſcript, in the royal library. 3. A Dialogue out of Xenophon, in Greek, between Hiero a King, yet ſome time a private perſon, and Simonides a Poet, as touching the life of the Prince and Private Man. Firſt printed, from a manuſcript in her majeſty's own hand writing, in the Gentleman's Magazine for 1743. 4. Two orations of Iſocrates, tranſlated into Latin. 5. Latin Oration at Cambridge. Preſerved in the king's library: alſo in Hollinſhed's Chron. p. 1206; and in Fuller's Hiſt. of Cambr. p. 138. 6. Latin Oration at Oxford. See Wood's Hiſt. and Antiq. of Oxf. lib i. p. 289. alſo in Dr Jebb's Append. to his Life of Mary Queen of Scots. 7. A Comment on Plato. 8. *Boethius de conſolatione philoſophiæ*, tranſlated into Engliſh anno 1593. 9. *Salluſt de bello Jugurthino*, tranſlated into Engliſh anno 1590. 10. A play of Euripides, tranſlated into Latin, (Cat. of Royal Auth.) 11. A Prayer for the uſe of her fleet in the great expedition in 1596. 12. Part of Horace's Art of Poetry, tranſlated into Engliſh anno 1598. 13. *Plutarch de curioſitate*, tranſlated into Engliſh. 14. Letters on various occaſions to different perſons; ſeveral ſpeeches to her parliament; and a number of other pieces.

ELIZABETH PETROWNA. (daughter of Peter the Great), the laſt empreſs of Ruſſia, diſtinguiſhed herſelf by her ſignal clemency. She made a vow, that no perſon ſhould be put to death in her reign, and ſhe ſtrictly obſerved it. The example has been followed, and confirmed by law. under the preſent auguſt ſovereign of Ruſſia, Catharine II. Elizabeth died in 1762, in the 21ſt year of her reign and 52d of her age.

ELK, in zoology. See CERVUS.

ELL, *(ulna,)* a meaſure, which obtains, under different denominations, in moſt countries, whereby cloths, ſtuffs, linens, ſilks, &c. are uſually meaſured; anſwering nearly to the yard of England, the canna of Italy, the vara of Spain, the palm of Sicily, &c.

Servius will have the ell to be the ſpace contained between the two hands when ſtretched forth; but Suetonius makes it only the cubit.

The ells moſt frequently uſed with us are the Engliſh and Flemiſh; the former containing three feet nine inches, or one yard and a quarter; the latter only 27 inches, or three quarters of a yard; ſo that the ell Engliſh is to the Flemiſh ell as five to three. In Scotland, the ell contains $37\frac{2}{10}$ Engliſh inches.

M. Ricard, in his Treatiſe of Commmerce, reduces the ells thus: 100 ells of Amſterdam are equal to $98\frac{3}{4}$ of Brabant, Antwerp, and Bruſſels; to $58\frac{1}{2}$ of England and France; to 120 of Hamburgh, Francfort, Leipſic, and Cologne; 125 of Breſlaw; 110 of Bergen and Drontheim; and 117 of Stockholm.

Elliot.

ELLIOT, (the Right Honourable George Auguſtus, Lord Heathfield), was the youngeſt ſon of the late Sir Gilbert Elliot, Baronet, of Stobbs (A) in Roxburghſhire; and was born about the year 1718. He received the firſt rudiments of his education under a private tutor; and at an early time of life was ſent to the univerſity of Leyden, where he made conſiderable progreſs in claſſical learning, and ſpoke with fluency and elegance the German and French languages. Being deſigned for a military life, he was ſent from thence to the celebrated *Ecole Royale du Genie Militaire*, conducted by the great Vauban, at La Fere in Picardy; where he laid the foundation of what he ſo conſpicuouſly exhibited at the defence of Gibraltar. He completed his military courſe on the continent by a tour, for the purpoſe of ſeeing in practice what he had ſtudied in theory. Pruſſia was the model for diſcipline, and he continued ſome time as a volunteer in that ſervice.

Mr Elliot returned in the 17th year of his age to his native country, Scotland; and was the ſame year, 1735, introduced by his father Sir Gilbert to Lieutenant-Colonel Peers of the 23d regiment of foot, then lying at Edinburgh, as a youth anxious to bear arms for his king and country. He was accordingly entered as a volunteer in that regiment, where he continued for a year or more. From the 23d regiment he went into the engineer corps at Woolwich, and made great progreſs in that ſtudy, until his uncle Colonel Elliot brought him in his adjutant of the ſecond troop of horſe grenadiers. With theſe troops he went upon ſervice to Germany, and was with them in a variety of actions. At the battle of Dettingen he was wounded. In this regiment he bought the rank of captain and major, and afterwards purchaſed the lieutenant-colonelcy from Colonel Brewerton, who ſucceeded to his uncle. On arriving at this rank, he reſigned his commiſſion as an engineer, which he had enjoyed along with his other rank, and in which ſervice he had been actively employed very much to the advantage of his country. He received the inſtructions of the famous engineer Bellidor, and made himſelf completely maſter of the ſcience of gunnery. Had he not ſo diſintereſtedly reſigned his rank in the engineer department, he would long before his death, by regular progreſſion, have been at the head of that corps. Soon after this he was appointed aid-de-camp to George II. and was diſtinguiſhed for his military ſkill and diſcipline. In the year 1759, he quitted the ſecond troop of horſe grenadier guards, being ſelected to raiſe, form, and diſcipline,

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(A) The ancient and honourable family of Elliot of Stobbs, as well as the collateral branch of Elliot of Minto in the ſame county, and of Elliot of Port-Elliot in Cornwall, are originally from Normandy. Their anceſtor, Mr Aliott, came over with William the Conqueror, and held a diſtinguiſhed rank in his army. There is a traditionary anecdote in the family relating to an honourable diſtinction in their coat, which, as it correſponds with hiſtory, bears the probability of truth. When William ſet foot on Engliſh land, he ſlipped and fell on the earth. He ſprung up, and exclaimed that it was a happy omen—he had embraced the country of which he was to become the lord. Upon this Aliott drew his ſword, and ſwore by the honour of a ſoldier, that he would maintain, at the hazard of his blood, the right of his lord to the ſovereignty of the earth which he had embraced. On the event of conqueſt, King William added to the arms of Aliott, which was a baton *or*, on a field *azure*, an arm and ſword as a creſt, with the motto, *Per ſaxa, per ignes, fortiter et recte.*

Elliot. diſcipline, the firſt regiment of light horſe, called after him *Elliot's*. As ſoon as they were raiſed and formed, he was appointed to the command of the cavalry in the expedition on the coaſts of France, with the rank of brigadier general. After this he paſſed into Germany, where he was employed on the ſtaff, and greatly diſtinguiſhed himſelf in a variety of movements; where his regiment diſplayed a ſtrictneſs of diſcipline, an activity and enterpriſe, which gained them ſignal honour: and indeed they have been the pattern regiment, both in regard to diſcipline and appointment, to the many light dragoon troops that have been ſince raiſed in our ſervice. From Germany he was recalled for the purpoſe of being employed as ſecond in command in the memorable expedition againſt the Havannah; the circumſtances of which conqueſt are well known.

On the peace his gallant regiment was reviewed by the king, when they preſented to his majeſty the ſtandards which they had taken from the enemy. Gratified with their fine diſcipline and high character, the king aſked General Elliot what mark of his favour he could beſtow on his regiment equal to their merit? He anſwered, that his regiment would be proud if his majeſty ſhould think, that, by their ſervices, they were intitled to the diſtinction of *Royals*. It was accordingly made a royal regiment, with this flattering title, "The 15th, or *King*'s Royal Regiment of Light Dragoons." At the ſame time the king expreſſed a deſire to confer ſome honour on the general himſelf; but the latter declared, that the honour and ſatisfaction of his Majeſty's approbation of his ſervices was his beſt reward.

During the peace he was not idle. His great talents in the various branches of the military art gave him ample employment. In the year 1775, he was appointed to ſucceed General A'Court as commander in chief of the forces in Ireland; but did not continue long in this ſtation, not even long enough to unpack all his trunks: for finding that interferences were made by petty authority derogatory of his own, he reſiſted the practice with becoming ſpirit; and not chooſing to diſturb the government of the ſiſter kingdom on a matter perſonal to himſelf, he ſolicited to be recalled. He accordingly was ſo, and appointed to the command of Gibraltar in a fortunate hour for the ſafety of that important fortreſs. The ſyſtem of his life, as well as his education, peculiarly qualified him for this truſt. He was perhaps the moſt abſtemious man of the age; neither indulging himſelf in animal food nor wine. He never ſlept more than four hours at a time; ſo that he was up later and earlier than moſt other men. He ſo inured himſelf to habits of hardineſs, that the things which are difficult and painful to other men, were to him his daily practice, and rendered pleaſant by uſe. It could not be eaſy to ſtarve ſuch a man into a ſurrender, nor poſſible to ſurpriſe him. The example of the commander in chief in a beſieged garriſon had a moſt perſuaſive efficacy in forming the manners of the ſoldiery. Like him his brave followers came to regulate their lives by the moſt ſtrict rules of diſcipline before there aroſe a neceſſity for ſo doing; and ſevere exerciſe, with ſhort diet, became habitual to them by their own choice. The military ſyſtem of diſcipline which he introduced, and the preparations which he made for his defence, were contrived with ſo much judgment, and executed with ſo much addreſs, that he was able with a handful of men to preſerve his poſt againſt an attack, the conſtancy of which, even without the vigour, had been ſufficient to exhauſt any common ſet of men. Collected within himſelf, he in no inſtance deſtroyed, by premature attacks, the labours which would coſt the enemy time, patience, and expence to complete; he deliberately obſerved their approaches, and ſeized on the proper moment, with the keeneſt perſpection, in which to make his attack with ſucceſs. He never ſpent his ammunition in uſeleſs parade or in unimportant attacks He never relaxed from his diſcipline by the appearance of ſecurity, nor hazarded the lives of his garriſon by wild experiments. By a cool and temperate demeanour, he maintained his ſtation for three years of conſtant inveſtment, in which all the powers of Spain were employed. All the eyes of Europe were on this garriſon; and his conduct has juſtly exalted him to the moſt elevated rank in the military annals of the day. On his return to England, the gratitude of the Britiſh ſenate was as forward as the public voice in giving him that diſtinguiſhed mark his merit deſerved. Both houſes of parliament voted an unanimous addreſs of thanks to the general. The king conferred on him the honour of Knight of the Bath, with a penſion during his own and a ſecond life of his own appointment; and on June 14. 1787, his majeſty advanced him to the peerage by the title of *Lord Heathfield Baron Gibraltar*, permitting him to take, in addition to his family arms, the arms of the fortreſs he had ſo bravely defended, to perpetuate to futurity his noble conduct.

His lordſhip died on the 6th of July 1790, at his chateau at Aix-la-Chapelle, of a ſecond ſtroke of the palſy, after having for ſome weeks preceding enjoyed tolerable good health and an unuſual flow of ſpirits. His death happened two days before he was to have ſet out for Leghorn in his way to Gibraltar; of which place he was once more appointed to the defence, in the view of an approaching war.—He married Ann, daughter of Sir Francis Drake of Devonſhire; and had by her (who died in 1769) Francis-Auguſtus, now Lord Heathfield, lieutenant-colonel of the 6th regiment of horſe.

ELLIPOMACROSTYLA, in natural hiſtory, the name of a genus of cryſtals. The word is derived from the Greek, *ελλιπης imperfect*, *μακρος long*, and *στυλος a column;* and expreſſes an imperfect cryſtal with a long column. The perfect figure of cryſtal being a column terminated by a pyramid at each end; thoſe which want this character are eſteemed imperfect: and accordingly the bodies of this genus are defined to be imperfect cryſtals with ſingle pyramids; one end of their column being affixed to ſome ſolid body, and compoſed of thin and ſlender hexangular columns, terminated by hexangular pyramids.

ELLIPOPACHYSTYLA, in natural hiſtory, the name of a genus of cryſtals. The word is derived from the Greek, *ελλιπης imperfect*, *παχυς thick*, and *στυλος a column;* and expreſſes a cryſtal of the imperfect kind with a thick column. The bodies of this genus are cryſtals compoſed of an hexangular column, conſiderably thick and ſhort, affixed irregularly at one end to ſome ſolid body, and terminated at the other by an hexangular pyramid.

ELLIPSIS, in geometry, a curve line returning into itſelf, and produced from the ſection of a cone by a plane cutting both its ſides, but not parallel to the baſe. See *Conic Sections*.

Ellipsis, in grammar, a figure of ſyntax, wherein one or more words are not expreſſed; and from this deficiency it has got the name *ellipſis*.

ELLIPTIC, or Elliptical, ſomething belonging to an ellipſis.

ELLIPOMACHROSTYLA, in natural hiſtory, a genus of imperfect cryſtals, with ſingle pyramids; one end of their column being affixed to ſome ſolid body. They are dodecahedral, with hexangular columns and hexangular pyramids.

Of theſe cryſtals authors enumerate a great many ſpecies; among which are the whitiſh pellucid ſprig cryſtal, a bright brown kind, a dull brown kind, and a bright yellow kind; all which are farther diſtinguiſhed according to the different lengths of their pyramids.

ELLIPOPACRYSTYLA, in natural hiſtory a genus of imperfect cryſtals, compoſed of 12 planes, in an hexangular column, terminated by an hexangular pyramid at one end, and irregularly affixed to ſome other body at the other, with ſhorter columns.

There are two ſpecies of theſe cryſtals; one ſhort, bright, and colourleſs, found in great plenty in New Spain and other parts of America; the other, a ſhort, dull, and duſky brown one, found in Germany, and ſometimes in England.

ELLISIA, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 28th order, *Luridæ*. The corolla is monopetalous and funnelſhaped; the berry carnous and bilocular; there are two ſeeds muricated or ſet with ſmall raiſed points, the one higher than the other.

ELM, in botany. See Ulmus.

ELMACINUS (George), author of a *Hiſtory of the Saracens*, was born in Egypt towards the middle of the 13th century. His hiſtory comes down from Mahomet to the year of the Hegira 512, anſwering to the year of our Lord 1134; in which he ſets down year by year, in a very conciſe manner, whatever regards the Saracen empire, intermixed with ſome paſſages relating to the eaſtern Chriſtians. His abilities muſt have been conſiderable; ſince, though he profeſſed Chriſtianity, he held an office of truſt near the perſons of the Mahometan princes. He was ſon to Yaſer Al Amid, ſecretary to the council of war under the ſultans of Egypt for 45 years; and in 1238, when his father died, ſucceeded him in his place. His hiſtory of the Saracens was tranſlated from Arabic into Latin by Erpinius; and printed in theſe two languages in folio, at Leyden, in 1625. Erpinius died before the publication; but Golius took care of it, and added a preface. It was dedicated by Erpinius's widow to Dr Andrews, biſhop of Wincheſter.

ELOCUTION. See Oratory, Part III.

ELOGY, a praiſe or panegyric beſtowed on any perſon or thing, in conſideration of its merit. The beauty of elogy conſiſts in an expreſſive brevity. Elogiums ſhould not have ſo much as one epithet, properly ſo called, nor two words ſynonymous: they ſhould ſtrictly adhere to truth; for extravagant and improbable elogies rather leſſen the character of the perſon or thing they would extol.

ELOHI, Eloi, or *Elohim*, in ſcripture, one of the names of God. But it is to be obſerved, that angels, princes, great men, judges, and even falſe gods, are ſometimes called by this name. The ſequel of the diſcourſe is what aſſiſts us in judging rightly concerning the true meaning of this word. It is the ſame as *Eloha*. One is the ſingular, the other the plural. Nevertheleſs *Elohim* is often conſtructed in the ſingular number, particularly when the true God is ſpoken of; but when falſe gods are ſpoke of, it is conſtrued rather in the plural.

ELOINED, in law, ſignifies reſtrained or hindered from doing ſomething: thus it is ſaid, that if thoſe within age be eloined, ſo that they cannot ſue perſonally, their next friend ſhall ſue for them.

ELONGATION, in aſtronomy, the digreſſion or receſs of a planet from the ſun, with reſpect to an eye placed on our earth. The term is chiefly uſed in ſpeaking of Venus and Mercury, the arch of a great circle intercepted between either of theſe planets and the ſun being called the *elongation* of that planet from the ſun.

Elongation, in ſurgery, is an imperfect luxation, occaſioned by the ſtretching or lengthening of the ligaments of any part.

ELOPEMENT, in law, is where a married woman departs from her huſband, and cohabits with an adulterer; in which caſe the huſband is not obliged to allow her any alimony out of his eſtate, nor is he chargeable for neceſſaries for her of any kind. However, the bare advertiſing a wife in the gazette, or other public paper, is not a legal notice to perſons in general not to truſt her; though a perſonal notice given by the huſband to particular perſons is ſaid to be good.—An action lies, and large damages may be recovered, againſt a perſon for carrying away and detaining another man's wife.

ELOQUENCE, the art of ſpeaking well, ſo as to affect and perſuade. See Oratory.

ELSHEIMER (Adam), a celebrated painter, born at Francfort on the Maine, 1574. He was firſt a diſciple of Philip Uffenbach a German; but his deſire of improvement carrying him to Rome, he ſoon became a moſt excellent artiſt in landſcapes, hiſtory, and night-pieces, with ſmall figures. His works are but few; and the great pains he beſtowed in finiſhing them raiſed their prices ſo high, that they are hardly any where to be found but in the cabinets of princes. He was of a melancholy turn, and ſunk under the embarraſſments of his circumſtances in 1610. James Erneſt Thomas of Landau was his diſciple; and imitated his ſtyle ſo nicely, that their performances are not eaſily diſtinguiſhed.

ELSIMBURG, a port-town of Sweden, in the province of Gothland, and territory of Schonen, ſeated on the ſide of the Sound, over againſt Elſinore. It was formerly a fortreſs belonging to the Danes; but all the fortifications were demoliſhed in 1679, and there is only one tower of a caſtle which remains undemoliſhed. It now belongs to Sweden. E. Long. 13. 20. N. Lat. 56. 2.

**ELSINORE**, or Elſinoor, a port-town of Denmark, ſeated on the Sound, in the iſle of Zealand. E. Long. 13. 23. N. Lat. 56. 0.—It was a ſmall village, containing a few fiſhermens huts, until 1445, when it was made a ſtaple town by Eric of Pomerania; who conferred upon the new ſettlers conſiderable immunities, and built a caſtle for their defence. From that period it gradually increaſed in ſize and wealth, and is now the moſt commercial place in Denmark next to Copenhagen. It contains about 5000 inhabitants, amongſt whom are a conſiderable number of foreign merchants, and the conſuls of the principal nations trading to the Baltic. The paſſage of the Sound is guarded by the fortreſs of Cronborg, which is ſituated upon the edge of a peninſular promontory, the neareſt point of land from the oppoſite coaſt of Sweden. It is ſtrongly fortified towards the ſhore by ditches, baſtions, and regular entrenchments; and towards the ſea by ſeveral batteries, mounted with 60 cannon, the largeſt whereof are 48 pounders. Every veſſel, as it paſſes, lowers her top-ſails, and pays a toll at Elſinore. It is generally aſſerted, that this fortreſs guards the Sound; and that all the ſhips muſt, on account of the ſhoal waters and currents, ſteer ſo near the batteries as to be expoſed to their fire in caſe of refuſal. This, however, is a miſtaken notion. On account indeed of the numerous and oppoſite currents in the Sound, the ſafeſt paſſage lies near the fortreſs; but the water in any part is of ſufficient depth for veſſels to keep at a diſtance from the batteries, and the largeſt ſhips can even ſail cloſe to the coaſt of Sweden. The conſtant diſcharge, however, of the toll, is not ſo much owing to the ſtrength of the fortreſs as to a compliance with the public law of Europe Many diſputes have ariſen concerning the right by which the crown of Denmark impoſes ſuch a duty. The kings of Sweden, in particular, claiming an equal title to the free paſſage of the Strait, were for ſome time exempted by treaty from paying it; but in 1720, Frederic I. agreed that all Swediſh veſſels ſhould for the future be ſubject to the uſual impoſts. All veſſels, beſide a ſmall duty, are rated at 1¼ *per cent.* of their cargoes, except the Engliſh, French, Dutch, and Swediſh, which pay only one *per cent.* and in return, the crown takes the charge of conſtructing light-houſes, and erecting ſignals to mark the ſhoals and rocks. from the Categate to the entrance into the Baltic. The tolls of the Sound, and of the two Belts, ſupply an annual revenue of above L.100,000.

**ELVAS**, a large town, and one of the beſt and moſt important in Portugal, ſeated in the province of Alentejo, a few miles from the frontiers of Eſtramadura in Spain. It is built on a mountain, and is ſtrongly fortified with works of free-ſtone. The ſtreets of the town are handſome, and the houſes neat; and there is a ciſtern ſo large, that it will hold water enough to ſupply the whole town ſix months. The water is conveyed to it by a magnificent aqueduct, three miles in length, ſuſtained in ſome places by four or five high arches, one upon another. It was bombarded by the French and Spaniards in 1706, but without effect. It has generally a garriſon of 1000 men. The king founded an academy here, in 1733, for young gentlemen. W. Long. 7. 28. N. Lat. 38. 39

**ELUDING**, the act of evading or rendering a thing vain and of no effect; a dexterous getting clear, or eſcaping out of an affair, difficulty, embarraſſment, or the like. We ſay, to *elude* a propoſition, &c. The deſign of chicanery is, to *elude* the force of the laws: this doctor has not reſolved the difficulty, but *eluded* it. Alexander, ſays the hiſtorian, in cutting the Gordian knot, either *eluded* the oracle or fulfilled it: *Ille nequicquam luctatus cum latentibus nodis, Nihil, inquit, intereſt, quomodo ſolvatur; gladioque ruptis omnibus loris, oraculi ſortem vel* eludit, *vel implevit.*

**ELVELA**, in botany: A genus of the natural order of fungi, belonging to the cryptogamia claſs of plants. The fungus is turbinated, or like an inverted cone.

**ELUL**, in ancient chronology, the 12th month of the Jewiſh civil year, and the ſixth of the eccleſiaſtical: it conſiſted of only 29 days, and anſwered pretty nearly to our Auguſt.

**ELUTRIATION**, in chemiſtry, an operation performed by waſhing ſolid ſubſtances with water, ſtirring them well together, and haſtily pouring off the liquid, while the lighter part remains ſuſpended in it, that it may thereby be ſeparated from the heavier part. By this operation metallic ores are ſeparated from earth, ſtones, and other unmetallic particles adhering to them.

**ELY**, a city and biſhop's ſee of Cambridgeſhire, ſituated about 12 miles north of Cambridge. E. Long. 15. 0. N. Lat. 52. 24. It is a county of itſelf, including the territory around; and has a judge who determines all cauſes civil and criminal within its limits. The church hath undergone various alterations ſince it was firſt eſtabliſhed by Etheldra, the wife of Egfride, king of Northumberland, who founded a religious houſe here, and planted it with virgins, and became the firſt abbeſs of it herſelf. The Danes entirely ruined this eſtabliſhment; then Ethelwald, the 27th biſhop of Wincheſter, rebuilt the monaſtery, and filled it with monks; to whom king Edgar, and many ſucceeding monarchs, beſtowed many privileges, and great grants of land; ſo that this abbey became in proceſs of time the beſt of any in England. Richard, the 11th abbot, wiſhing to free himſelf of the biſhop of Lincoln, within whoſe dioceſe his monaſtery was ſituated, and not liking ſo powerful a ſuperior, he made great intereſt with king Henry I. to get Ely erected into a biſhoprick; and ſpared neither purſe nor prayers to bring this about. He even brought the biſhop of Lincoln to conſent to it, by giving him and his ſucceſſors the manors of Bugden, Biggleſwade, and Spalding, which belonged to the abbey, in lieu of his juriſdiction; but he lived not to taſte the ſweets of his induſtry and ambition, he dying before his abbey was erected into a ſee. His ſucceſſor was the firſt biſhop of Ely: but the great privileges the biſhop enjoyed were almoſt wholly taken away, or much reſtricted, by the act of parliament, 27th Henry VIII. regarding the reſtoring to the crown the ancient royalties: So, inſtead of being palatine of the iſle of Ely, the biſhop and his temporal ſteward were by that act declared to be from thenceforth juſtices of the peace in the ſaid iſland. This dioceſe contains all Cambridgeſhire, and the iſle of Ely, excepting Iſelham, which belongs to the ſee of Rocheſter, and 15 other pariſhes, that are in the dioceſe of Norwich; but it has a pariſh in Norfolk,

folk, viz. Emneth. The number of pariſhes in this dioceſe are 141, whereof 75 are impropriate. It hath but one archdeacon, viz. of Ely. It is valued in the king's books at L.2134 : 18 : 5. The clergy's tenth, amounting to the ſum of L.384 : 14 : 9¼. The biſhopric is computed to be worth annually L.4000. The church is dedicated to St Ethelred. The building, as it now appears, has been the work of ſeveral of its biſhops. The weſt parts were rebuilt by biſhop Ridal; the choir and lanthern were begun by biſhop Norwold, and finiſhed by biſhop Frodſham. This ſee hath given two ſaints and two cardinals to the church of Rome; and to the Engliſh nation nine lord chancellors, ſeven lord treaſurers, one lord privy-ſeal, one chancellor of the exchequer, one chancellor to the univerſity of Oxford, two maſters of the rolls, and three almoners. To this cathedral belong a biſhop, a dean, an archdeacon, eight prebendaries, with vicars, lay-clerks, choriſters, a ſchoolmaſter, uſher, and 28 king's ſcholars.

ELYMAIS, the capital city of the land of Elam, or the ancient Perſia. We are told (1 Mac. vi. 1.) that Antiochus Epiphanes, having underſtood that there were very great treaſures lodged in a temple at Elymais, determined to go and plunder it: but the citizens getting intelligence of his deſign, made an inſurrection, forced him out of the city, and obliged him to fly. The author of the ſecond book of Maccabees (ix. 2.) calls this city *Perſepolis*, in all probability becauſe formerly it was the capital of Perſia: for it is known from other accounts, that Perſepolis and Elymais were two very different cities, the latter ſituated upon the Eulæus, the former upon the Araxis.

ELYMUS, in botany: A genus of the digynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the fourth order, *Gramina*. The calyx is lateral, bivalved, aggregate, and multiflorous.

ELYOT (Sir Thomas), a gentleman of eminent learning in the 16th century, was educated at Oxford, travelled into foreign countries, and upon his return was introduced to court. His learning recommended him to Henry VIII. who conferred the honour of knighthood on him, and employed him in ſeveral embaſſies; particularly in 1532, to Rome, about the divorce of queen Catharine, and afterwards to Charles V. about 1536. He wrote. *The Caſtle of Health*, *The Governor*, *Banquet of Sapience*, *Of the Education of Children*, *De rebus memorabilibus Angliæ*, and other books; and was highly eſteemed by all his learned cotemporaries.

ELYSIUM, (Ελυσιος,) in the ancient theology, or rather mythology, a place in the *inferi* or lower world, furniſhed with fields, meads, agreeable woods, groves, ſhades, rivers, &c. whither the ſouls of good people were ſuppoſed to go after this life.

Orpheus, Hercules, and Æneas, are ſuppoſed to have deſcended into Elyſium in their life-time, and to have returned again; (Virg. lib. vi. ver. 638, &c.) Tibullus (lib. i. eleg. 3.) gives us fine deſcriptions of the Elyſian fields.

Virgil oppoſes Elyſium to Tartarus; which was the place where the wicked underwent their puniſhment.

> *Hic locus eſt, partes ubi ſe via findit in ambas:*
> *Dextera, quæ Ditis magni ſub mœnia tendit:*
> *Hac iter* Elyſium *nobis: at læva malorum*
> *Exercet pœnas, & ad impia Tartara mittit.*

He aſſigns Elyſium to thoſe who died for their country, to thoſe of pure lives, to truly inſpired poets, to the inventors of arts, and to all who have done good to mankind.

Some authors take the fable of Elyſium to have been borrowed from the Phœnicians; as imagining the name *Elyſium* formed from the Phœnician עלז *alaz*, or עלץ *alats*, or עלס *alas*, "to rejoice," or "to be in joy;" the letter *a* being only changed into *e*, as we find done in many other names; as in *Enakim* for *Anakim*, &c. On which footing, Elyſian fields ſhould ſignify the ſame thing as a place of pleaſure; or,

> ——*Locos lætos, & amœna virecta*
> *Fortunatorum nemorum, ſedeſque beatas.* Virg.

Others derive the word from the Greek λυω *ſolvo*, "I deliver, I let looſe or diſengage;" becauſe here mens ſouls are freed or diſincumbered from the fetters of the body. Beroaldus, and Hornius (Hiſt. Philoſoph. lib. iii. cap. 2.) take the place to have derived its name from Eliza, one of the firſt perſons who came into Greece after the deluge, and the author and father of the Ætolians.

The Elyſian fields were, according to ſome, in the Fortunate Iſlands on the coaſt of Africa; in the Atlantic. Others place them in the iſland of Leuce; and according to the authority of Virgil, they were ſituated in Italy. According to Lucian, they were near the moon; or in the centre of the earth, if we believe Plutarch. Olaus Wormius contends that it was in Sweden the Elyſian fields were placed.

ELZEVIRS, celebrated printers at Amſterdam and Leyden, who greatly adorned the republic of letters by many beautiful editions of the beſt authors of antiquity. They fell ſomewhat below the Stephenſes in point of learning, as well as in their editions of Greek and Hebrew authors; but as to the choice of good books, they ſeem to have equalled, and in the neatneſs and elegance of their ſmall characters, greatly to have exceeded them. Their Virgil, Terence, and Greek Teſtament, have been reckoned their maſterpieces; and are indeed ſo very fine, that they juſtly gained them the reputation of being the beſt printers in Europe. There were five of theſe Elzevirs, namely, Lewis, Bonaventure, Abraham, Lewis, and Daniel. Lewis began to be famous at Leyden in 1595, and was remarkable for being the firſt who obſerved the diſtinction between the *v* conſonant and *u* vowel, which had been recommended by Ramus and other writers long before, but never regarded. Daniel died in 1680 or 1681; and though he left children who carried on the buſineſs, paſſes nevertheleſs for the laſt of his family who excelled in it. The Elzevirs have printed ſeveral catalogues of their editions; but the laſt, publiſhed by Daniel, is conſiderably enlarged, and abounds with new books. It was printed at Amſterdam, 1674, in 12mo, and divided into ſeven volumes.

EMANATION, the act of flowing or proceeding from ſome ſource or origin. Such is the emanation of light from the ſun; or that of effluvia from odorous, &c. bodies; of wiſdom from God, &c.—The word is formed of the Latin *e* "out of," and *manare* "to flow or ſtream."

EMANATION is alſo uſed for the thing that proceeds, as well as the act of proceeding. The power given a judge is an emanation from the regal power; the reaſonable ſoul is an emanation from the Divinity.

EMANCIPATION, in the Roman law, the ſetting free a ſon from the ſubjection of his father; ſo that whatever moveables he acquires belong in property to him, and not to his father, as before emancipation.

Emancipation puts the ſon in a capacity of managing his own affairs, and of marrying without his father's conſent, though a minor. Emancipation differs from manumiſſion, as the latter was the act of a maſter in favour of a ſlave, whereas the former was that of a father in favour of his ſon.

There were two kinds of emancipation: the one tacit, which was by the ſon's being promoted to ſome dignity, by his coming of age, or by his marrying, in all which caſes he became his own maſter of courſe. The other, expreſs; where the father declared before a judge, that he emancipated his ſon. In performing this, the father was firſt to ſell his ſon imaginarily to another, whom they called *pater fiduciarius*, father in truſt; of whom being bought back again by the natural father, he manumitted him before the judge by a verbal declaration.

Emancipation ſtill obtains in France with regard to minors or pupils, who are hereby ſet at liberty to manage their own effects, without the advice or direction of their parents or tutors.

EMARGINATED, among botaniſts. See BOTANY, p. 444, n° 181.

EMASCULATION, the act of caſtrating or depriving a male of thoſe parts which characteriſe his ſex. See CASTRATION, and EUNUCH.

EMAUS, EMMAUS, or *Ammaus*, (anc. geog.), a village, 60 ſtadia to the north-weſt of Jeruſalem, or about ſeven miles: it afterwards became a town, and a Roman colony, *Nicopolis*, (Jerome). Reland has another *Emmaus* towards Lydda, 22 miles from Jeruſalem, (Itinerary); a third, near Tiberias.

EMBALMING, is the opening a dead body, taking out the inteſtines, and filling the place with odoriferous and deficcative drugs and ſpices, to prevent its putrifying. The Egyptians excelled all other nations in the art of preſerving bodies from corruption; for ſome that they have embalmed upwards of 2000 years ago, remain whole to this day, and are often brought into other countries as great curioſities. Their manner of embalming was thus: they ſcooped the brains with an iron ſcoop out at the noſtrils, and threw in medicaments to fill up the vacuum: they alſo took out the entrails, and having filled the body with myrrh, caſſia, and other ſpices, except frankincenſe, proper to dry up the humours, they pickled it in nitre, where it lay ſoaking for 70 days. The body was then wrapped up in bandages of fine linen and gums, to make it ſtick like glue; and ſo was delivered to the kindred of the deceaſed, entire in all its features, the very hairs of the eye-lids being preſerved. They uſed to keep the bodies of their anceſtors, thus embalmed, in little houſes magnificently adorned, and took great pleaſure in beholding them, alive as it were, without any change in their ſize, features, or complexion. The Egyptians alſo embalmed birds, &c. The prices for embalming were different; the higheſt was a talent, the next 29 minæ, and ſo decreaſing to a very ſmall matter: but they who had not wherewithal to anſwer this expence, contented themſelves with infuſing, by means of a ſyringe, through the fundament, a certain liquor extracted from the cedar; and, leaving it there, wrapped up the body in ſalt of nitre: the oil thus preyed upon the inteſtines, ſo that when they took it out, the inteſtines came away with it, dried, and not in the leaſt putrified: the body being encloſed in nitre, grew dry, and nothing remained beſides the ſkin glued upon the bones.

The method of embalming uſed by the modern Egyptians, according to Maillet, is to waſh the body ſeveral times with roſe-water, which, he elſewhere obſerves, is more fragrant in that country than with us; they afterwards perfume it with incenſe, aloes, and a quantity of other odours, of which they are by no means ſparing; and then they bury the body in a winding ſheet, made partly of ſilk and partly of cotton, and moiſtened, as is ſuppoſed, with ſome ſweet-ſcented water or liquid perfume, though Maillet uſes only the term *moiſtened*; this they cover with another cloth of unmixed cotton, to which they add one of the richeſt ſuits of clothes of the deceaſed. The expence, he ſays, on theſe occaſions, is very great, though nothing like what the genuine embalming coſt in former times.

EMBARCADERO, in commerce, a Spaniſh term, much uſed along the coaſts of America, particularly thoſe on the ſide of the South Sea. It ſignifies a place which ſerves ſome other conſiderable city farther within land, for a port or place of ſhipping, *i. e.* of embarking and diſembarking commodities. Thus Calao is the embarcadero of Lima, the capital of Peru; and Arica the embarcadero of Potoſi. There are ſome embarcaderos 40, 50, and even 60 leagues off the city, which they ſerve in that capacity.

EMBARGO, in commerce, an arreſt on ſhips or merchandiſe, by public authority; or a prohibition of ſtate, commonly on foreign ſhips, in time of war, to prevent their going out of port, ſometimes to prevent their coming in, and ſometimes both, for a limited time.

The king may lay embargoes on ſhips, or employ thoſe of his ſubjects, in time of danger, for the ſervice and defence of the nation: but they muſt not be for the private advantage of a particular trader or company; and therefore a warrant to ſtay a ſingle ſhip is no legal embargo. No inference can be made from embargoes which are only in war-time; and are a prohibition by advice of council, and not at proſecution of parties. If goods be laden on board, and after an embargo or reſtraint from the prince or ſtate comes forth, and then the maſter of the ſhip breaks ground, or endeavours to ſail, if any damage accrues, he muſt be reſponſible for the ſame; the reaſon is, becauſe his freight is due, and muſt be paid, even tho' the goods be ſeized as contraband.

EMBARRASS, (*Embarraſſment*), a French term, though now naturalized; denoting a difficulty or obſtacle which perplexes or confounds a perſon, &c.

EMBASSADOR. See AMBASSADOR.

EMBASSY, the office or function of an AMBASSADOR.

EMBDEN, a port-town and city of Germany, capital of a county of the ſame name, now in poſſeſſion of the king of Pruſſia; it is ſituated at the mouth of the river Ens. E. Long. 6. 45. N. Lat. 53. 50.

EMBER-WEEKS, are thoſe wherein the *ember* or *embring days* fall.

In the laws of king Alfred, and thoſe of Canute, thoſe days are called *ymbren*, that is, circular days, from whence the word was probably corrupted into *ember-days*: by the canoniſts they are called *quatuor anni tempora*, the four cardinal ſeaſons, on which the circle of the year turns: and hence Henſhaw takes the word to have been formed, viz. by corruption from *temper* of *tempora*.

The ember-days are, the Wedneſday, Friday, and Saturday, after Quadrageſima Sunday, after Whitſunday, after Holy-rood day in September, and after St Lucia's day in December: which four times anſwer well enough to the four quarters of the year, Spring, Summer, Autumn, and Winter.

Mr Somner thinks they were originally faſts, inſtituted to beg God's bleſſing on the fruits of the earth. Agreeably to which, Skinner ſuppoſes the word *ember* taken from the aſhes, *embers*, then ſtrewed on the head.

Theſe ember-weeks are now chiefly taken notice of, on account of the ordination of prieſts and deacons; becauſe the canon appoints the Sundays next ſucceeding the ember-weeks, for the ſolemn times of ordination: Though the biſhops, if they pleaſe, may ordain on any Sunday or holiday.

EMBERIZA, in ornithology, a genus of birds belonging to the order of paſſeres. The bill is conical, and the mandibles recede from each other towards the baſe; the inferior mandible has the ſides narrowed inwards, but the upper one is ſtill narrower. The moſt remarkable ſpecies are,

1. The nivalis, or great pyed mountain-finch of Ray, and the ſnow-bird of Edwards, has white wings, but the outer edge of the prime-feathers are black; the tail is black, with three white feathers on each ſide. Theſe birds are called in Scotland *ſnow-flakes*, from their appearance in hard weather and in deep ſnows. They arrive in that ſeaſon among the Cheviot-hills and in the Highlands in amazing flocks. A few breed in the Highlands, on the ſummit of the higheſt hills, in the ſame places with the *ptarmigans*; but the greateſt numbers migrate from the extreme north. They appear in the Shetland iſlands; then in the Orkneys; and multitudes of them often fall, wearied with their flight, on veſſels in the Pentland Frith. Their appearance is a certain fore-runner of hard weather, and ſtorms of ſnow, being driven by the cold from their common retreats. Their progreſs ſouthward is probably thus; Spitzbergen and Greenland, Hudſon's Bay, the Lapland Alps, Scandinavia, Iceland, the Ferroe Iſles, Shetland, Orkneys, Scotland, and the Chivot-hills. They viſit at that ſeaſon all parts of the northern hemiſphere, Pruſſia, Auſtria, and Siberia. They arrive lean, and return fat. In Auſtria, they are caught and fed with millet, and, like the ortolan, grow exceſſively fat. In their flights, they keep very cloſe to each other, mingle moſt confuſedly together, and fling themſelves collectively into the form of a ball; at which inſtant the fowler makes great havock among them.

2. The miliaris, or grey emberiza, is of a greyiſh colour, ſpotted with black in the belly, and the orbits are reddiſh. It is the bunting of Engliſh authors, and a bird of Europe.

3. The hortulana, or ortolan, has black wings; the firſt three feathers on the tail are white on the edges, only the two lateral are black outwardly. The orbits of the eyes are naked and yellow; the head is greeniſh, and yellow towards the inferior mandible. It feeds principally upon the panick-graſs; grows very fat; and is reckoned a delicate morſel by certain epicures, eſpecially when fattened artificially. Theſe birds are found in ſeveral parts of Europe, but are not met with in Britain; are common in France and Italy, and ſome parts of Germany and Sweden, migrating from one to the other in ſpring and autumn; and in their paſſage are caught in numbers, in order to fatten for the table. This ſpecies will ſometimes ſing very prettily, and has been kept for that purpoſe. The ſong is not unlike that of the yellow-hammer, but finer and ſweeter. In ſome parts it makes the neſt in a low hedge; in others, on the ground. It is careleſsly conſtructed, not unlike that of the lark. The female lays four or five greyiſh eggs, and in general has two broods in a year.

The manner of fattening theſe birds for the table is as follows. They are taken and placed in a chamber lightened by lanthorns; ſo that, not knowing the viciſſitudes of day and night, they are not agitated by the change. Are fed with oats and millet; and grow ſo fat, that they would certainly die if not killed in a critical minute. They are a mere lump of fat; of a moſt exquiſite taſte, but apt ſoon to ſatiate. Theſe birds receive both their Greek and Latin name from their food, the millet. Ariſtotle calls them *cynchromi*; and the Latins, *miliariæ*. The latter kept and fattened them in their *ornithones*, or fowl-yards, as the Italians do at preſent; which the ancients conſtructed with the utmoſt magnificence, as well as conveniency.

4. The citrinella, or yellow-hammer, has a blackiſh tail, only the two outward ſide-feathers are marked on the inner edge with a ſharp white ſpot. It is a bird of Europe, and comes about houſes in winter: it builds its neſt on the ground on meadows.

5. The ſchœniclas, or reed-ſparrow, has a black head, a blackiſh-grey body, and a white ſpot on the quill-feathers. It inhabits marſhy places, moſt commonly among reeds, from which it takes its name. Its neſt is worthy of notice for the artful contrivance of it, being faſtened to four reeds, and ſuſpended by them like a hammock, about three feet above the water; the cavity of the neſt is deep, but narrow; and the materials are buſhes, fine bents, and hairs. It lays four or five eggs of a bluiſh white, marked with irregular purpliſh veins, eſpecially on the larger end. It is a bird much admired for its ſong; and, like the nightingale, it ſings in the night.

6. The oryzivora, or rice-bunting, with the head and whole under ſide of the body black; hind part of the

neck in ſome pale yellow, and in others white; coverts of the wings, and primaries, black, the laſt edged with white; part of the ſcapulars, leſſer coverts of the wings, and rump, white; back black, edged with dull yellow; tail of the ſame colours, and each feather ſharply pointed; the legs are red. The head, upper part of the neck, and back, of the female, is yellowiſh brown, ſpotted with black; the under part, of a dull yellow; the ſides thinly ſtreaked with black.

Theſe birds inhabit in vaſt numbers the iſland of Cuba, where they commit great ravages among the early crops of rice, which precede thoſe of Carolina. As ſoon as the crops of that province are to their palate, they quit Cuba, and paſs over the ſea, in numerous flights, directly north; and are very often heard in their paſſage by ſailors frequenting that courſe. Their appearance is in September, while the rice is yet milky; and commit ſuch devaſtations, that 40 acres of that grain have been totally ruined by them in a ſmall time. They arrive very lean: but ſoon grow ſo fat, as to fly with difficulty; and, when ſhot, often burſt with the fall. They continue in Carolina not much above three weeks, and retire by the time the rice begins to harden; going on to other parts, and ſtaying in each only ſo long as the rice continues green. They come into Rhode Iſland and New York at the end of April, or the ſecond week in May, frequenting the borders of fields, and live on inſects, &c. till the maize is fit for their palate; when they begin by pecking holes in the ſides of the huſks, and after ſatiating themſelves go on to another; which leaves room for the rain to get in, and effectually ſpoils the plants. They continue there during the ſummer, and breed; returning, as autumn approaches, to the ſouthward. The males and females do not arrive together; the females come firſt.—They are eſteemed to be the moſt delicate birds of thoſe parts; and the male is ſaid to have a fine note. This ſpecies is known in the country by the names of *bob lincoln* and *conquedle*; likewiſe called by ſome the *white-backed maize thief*.

There are above 50 other ſpecies; two of which, *viz.* the black-throated bunting a native of America, and the cinereous bunting an inhabitant of Canada, are figured on Plate CLXXXII. as ſpecimens of the genus.

EMBLEM, a kind of painted ænigma, which, repreſenting ſome obvious hiſtory, with reflections underneath, inſtructs us in ſome moral truth or other matter of knowledge. See Devise, Ænigma, &c.

Such is that very ſignificant image of Scævola holding his hand in the fire; with the words, *Agere et pati fortiter Romanum eſt*, "To do and ſuffer courageouſly is Roman."

The word is pure Greek, formed of the verb ἐμβαλλειν, "to caſt in, to inſert." Suetonius relates, that Tiberius made the word be eraſed out of the decree of the Roman ſenate, becauſe borrowed from another language.

The emblem is ſomewhat plainer and more obvious than the ænigma.—Gale defines emblem an ingenious picture, repreſenting one thing to the eye, and another to the underſtanding.

The Greeks alſo gave the name Emblems, ἐμβληματα, to inlayed or Moſaic works, and even to all kinds of ornaments of vaſes, moveables, garments, &c. And the Latins uſed *emblema* in the ſame ſenſe. Accordingly, Cicero reproaching Verres with the ſtatues and fine wrought works he had plundered from the Sicilians, calls the ornaments fixed thereto (and which on occaſion might be ſeparated from them) *emblemata*. Add, that Latin authors frequently compare the figures and ornaments of diſcourſe to theſe *emblemata*. Thus, an ancient Latin poet praiſing an orator, ſays, that all his words were ranged like the pieces in Moſaic:

> *Quam lepide* λεξεις *compoſtæ, ut teſſerulæ omnes,*
> *Arte pavimenti, atque* emblemate *vermiculato.*

With us, emblem ordinarily ſignifies no more than a painting, baſſo-relievo, or other repreſentation, intended to hold forth ſome moral or political inſtruction.

What diſtinguiſhes an emblem from a deviſe is, that the words of an emblem have a full complete ſenſe of themſelves; nay, all the ſenſe and ſignification which they have together with the figure. But there is a yet further difference between emblem and deviſe: for a deviſe is a ſymbol appropriated to ſome perſon, or that expreſſes ſomething which concerns him particularly; whereas an emblem is a ſymbol that regards all the world alike.

Theſe differences will be more apparent, from comparing the emblem above quoted, with the deviſe of a candle lighted, and the words *Juvando conſumor*, "I waſte myſelf in doing good." See Devise.

EMBOLISMUS, Εμβολισμος, in chronology, ſignifies "intercalation." The word is formed of ἐμβαλλειν, "to inſert."

As the Greeks made uſe of the lunar year, which is only 354 days, in order to bring it to the ſolar, which is 365 days, they had every two or three years an emboliſm, i. e. they added a 13th lunar month every two or three years, which additional month they called *embolimæus*, ἐμβολιμαιος, becauſe inſerted, or intercalated.

EMBOSSING, or Imbossing, in architecture and ſculpture, the forming or faſhioning works in relievo, whether cut with a chiſel or otherwiſe.

Emboſſing is a kind of ſculpture, wherein the figures ſtick out from the plane whereon it is cut: and according as the figures are more or leſs prominent, they are ſaid to be in alto, mezzo, or baſſo, relievo; or high, mean, or low, relief. See Enchasing.

EMBOTHRIUM, in botany: A genus of the monogynia order, belonging to the tetrandria claſs of plants. There is no calyx; the corolla conſiſts of four linear oblique petals; the ſtamina are four very ſhort filaments; the antheræ are pretty large, oblong, and ſeated within the cavity of the petal. The pericarpium is a round unilocular follicle, ſharpened at both ends; the ſeeds are four or five in number, egg-ſhaped, and compreſſed.

EMBRASURE, in architecture, the enlargement made of the aperture of a door or window, on the inſide of the wall; its uſe being to give the greater play for the opening of the door or caſement, or to admit the more light.

EMBROCATION, in ſurgery and pharmacy, an external kind of remedy, which conſiſts in an irrigation of the part affected, with ſome proper liquor, as oils, ſpirits, &c. by means of a woollen or linen cloth, or a ſpunge, dipped in the ſame.

EMBROIDERY, a work in gold, or ſilver, or ſilk thread, wrought by the needle upon cloth, ſtuffs, or muſlin, into various figures. In embroidering ſtuffs, the work is performed in a kind of loom; becauſe the more the piece is ſtretched, the eaſier it is worked. As to muſlin, they ſpread it upon a pattern ready deſigned; and ſometimes, before it is ſtretched upon the pattern, it is ſtarched, to make it more eaſy to handle. Embroidery on the loom is leſs tedious than the other, in which, while they work flowers, all the threads of the muſlin, both lengthwiſe and breadthwiſe, muſt be continually counted; but, on the other hand, this laſt is much richer in points, and ſuſceptible of greater variety. Cloths too much milled are ſcarce ſuſceptible of this ornament, and in effect we ſeldom ſee them embroidered. The thinneſt muſlins are left for this purpoſe; and they are embroidered to the greateſt perfection in Saxony: in other parts of Europe, however, they embroider very prettily, and eſpecially in France.

There are ſeveral kinds of embroidery: as, 1. Embroidery on the ſtamp; where the figures are raiſed and rounded, having cotton or parchment put under them to ſupport them. 2. Low embroidery; where the gold and ſilver lie low upon the ſketch, and are ſtitched with ſilk of the ſame colour. 3. Guimped embroidery: this is performed either in gold or ſilver; they firſt make a ſketch upon the cloth, then put on cut vellum, and afterwards ſow on the gold and ſilver with ſilk thread: in this kind of embroidery they often put gold and ſilver cord, tinſel, and ſpangles. 4. Embroidery on both ſides; that which appears on both ſides of the ſtuff. 5. Plain embroidery; where the figures are flat and even, without cords, ſpangles, or other ornaments.

By ſtat. 22. Geo. II. c. 36. no foreign embroidery, or gold and ſilver brocade, ſhall be imported, upon pain of being forfeited and burnt, and penalty of 100l. for each piece. No perſon ſhall ſell, or expoſe to ſale, any foreign embroidery, gold or ſilver thread, lace, fringe, brocade, or make up the ſame into any garment, on pain of having it forfeited and burnt, and penalty of 100l. All ſuch embroidery, &c. may be ſeized and burnt; and the mercer, &c. in whoſe cuſtody it was found, ſhall forfeit 100l.

EMBRUN, or AMBRUN, a city of Dauphiny, in France, near the confines of Piedmont. E. Long. 6. 6. N. Lat. 44. 35.

EMBRYO, in phyſiology, the firſt rudiments of an animal in the womb, before the ſeveral members are diſtinctly formed; after which period it is denominated a *fetus*. See GENERATION, and FETUS.

EMERALD, a genus of precious ſtones belonging to the order of ſiliceous earths. The word is derived, according to ſome, from the French *eſmaraude*, and that from the Latin *ſmaragdus*, ſignifying the ſame thing; by others it is ſaid to be derived from the Italian *ſmeraldo*, or the Arabian *zomorrad*. According to Cronſtedt the emerald is the ſofteſt of all the precious ſtones, though other naturaliſts place it the next after the diamond in this reſpect. It is perhaps the moſt beautiful of all the gems, and, according to Wallerius, when heated in the fire, changes its colour to a deep blue, and becomes phoſphoreſcent; but recovers its green colour when cold. When pulveriſed it has a white appearance, and, with borax, melts to a very thin and colourleſs glaſs. It becomes electric by being rubbed, and ſome have the property of the tourmalin, viz. of being electrified by heat, and in that ſtate attracting aſhes or other light ſubſtances; though the emeralds are leſs powerful than the tourmalin, and after having attracted the aſhes, they retain them without any ſigns of repulſion.

Pliny mentions twelve different kinds of theſe precious ſtones; though it appears, from the vaſt ſize of ſome of them, that they muſt have been only certain kinds of green ſpar, or other green ſtone, which at that time went under the name of *emerald* among the ancients. The true emerald is found only in very ſmall cryſtals, from the ſize $\frac{1}{16}$th of an inch in diameter to that of a walnut. Theophraſtus, however, mentions one four cubits long and three broad; likewiſe an obeliſk compoſed of only four emeralds, the whole length being 40 cubits, and the breadth from four to two.

Engeſtroom informs us, that the emeralds, in their rough or native ſtate, conſiſt of hexagonal columns moſtly truncated at both ends; and that he had ſome in his poſſeſſion, which in a gentle heat became colourleſs; but in a ſtrong heat white and opaque, without any mark of fuſion. Brunick diſtinguiſhes them into two claſſes. 1. The pale green emerald, which comes from the eaſt and from Peru, the figure being that of an hexagonal truncated priſm, and the baſis a vein of white quartz. 2. The dark green emerald, which is alſo columnar, but very dark-coloured, ſtriped longitudinally, and has little tranſparency. The points are generally broken off longitudinally, though Davila mentions one reſembling a blunt triangular pyramid; and in the Imperial cabinet at Vienna, there is one with a five-ſided pyramid. Theſe are the emeralds which become electrical by heat; though all of them do not; and thoſe which do ſo cannot be known but by actual experiment. The fineſt ſpecimen of the former kind of emeralds is to be ſeen in the treaſure of the holy chapel of Loretto, containing upwards of 100 of theſe precious ſtones great and ſmall. A fellow to this was made by art, and both were preſents to the king of Sicily, deſigned to repreſent two mount Calvaries.

Emeralds are diſtinguiſhed by the jewellers into two kinds, the oriental and occidental. The true oriental emerald is very ſcarce, and at preſent only found in the kingdom of Cambay. So great indeed is the ſcarcity of them, that an opinion prevailed that there are no oriental emeralds. This opinion is adopted, among others, by Mr Bruce; who informs us, that he made an excurſion to the iſland of emeralds in the Red Sea, and endeavours to ſhow that there never were any emeralds but what came from America, and that thoſe ſaid to have been found in the Eaſt Indies were imported from that continent. It is probable indeed, that in former times any kind of cryſtal tinged of a green colour might be called an *emerald*, and hence the green cochle ſpar brought from Egypt may have obtained the name of *mother of emeralds*; but of late ſome emeralds have been brought from Cambay into Italy which greatly excelled thoſe of America. The beſt emeralds of the weſtern continent come from Peru, and are called *oriental* by the jewellers: ſome are found in Europe, principally in the duchy of Sileſia in Germany.

*Rough* EMERALDS.—Thoſe of the firſt and coarſeſt ſort, called *plaſmes*, for grinding, are worth 27 ſhillings ſterling the marc, or 8 ounces. The demi-morillons, 8l. ſterl. per marc. Good morillons, which are only little pieces,

pieces, but of fine colour, from 13l. to 15l. per marc. Emeralds, larger than morillons, and called *of the third colour* or *ſort*, are valued at from 50l. to 60l. the marc. Emeralds, called *of the ſecond ſort*, which are in larger and finer pieces than the preceding, are worth from 65l. to 75l. per marc. Laſtly, thoſe of the firſt colour, otherwiſe called *negres cartes*, are worth from 110l. to 115l.

*Emeralds ready cut, or poliſhed and not cut, being of good ſtone, and a fine colour, are worth,*

| | | | L. | s. |
|---|---|---|---|---|
| Thoſe weighing one caract, or four grains | | | 0 | 10 |
| Thoſe of two caracts | —— | —— | 1 | 7 |
| Thoſe of three caracts | —— | —— | 2 | 5 |
| Thoſe of four caracts | —— | —— | 3 | 10 |
| Thoſe of five caracts | —— | —— | 4 | 10 |
| Thoſe of ſix caracts | —— | —— | 7 | 10 |
| Thoſe of ſeven caracts | —— | —— | 15 | 0 |
| Thoſe of eight caracts | —— | —— | 19 | 0 |
| Thoſe of nine caracts | —— | —— | 23 | 0 |
| Thoſe of ten caracts | —— | —— | 33 | 0 |

*To counterfeit Emeralds:* Take of natural cryſtal, four ounces; of red-lead, four ounces; verdegris, forty-eight grains; crocus martis, prepared with vinegar, eight grains: let the whole be finely pulverized and ſifted; put this into a crucible, leaving one inch empty: lute it well, and put it into a potter's furnace, and let it ſtand there as long as they do their pots. When cold, break the crucible; and you will find a matter of a fine emerald colour, which, after it is cut and ſet in gold, will ſurpaſs in beauty an oriental emerald.

EMERSION, in phyſics, the riſing of any ſolid above the ſurface of a fluid ſpecifically heavier than itſelf, into which it had been violently immerged or thruſt.

It is one of the known laws of hydroſtatics, that a lighter ſolid being forced down into a heavier fluid, immediately endeavours to emerge; and that with a force or moment equal to the exceſs of weight of a quantity of the fluid above that of an equal bulk of the ſolid. Thus, if a ſolid be immerged in a fluid of double its ſpecific gravity, it will emerge again till half its bulk or body be above the ſurface of the fluid.

Emersion, in aſtronomy, is when the ſun, moon, or other planet, begins to re-appear, after its having been eclipſed, or hid by the interpoſition of the moon, earth, or other body.

The difference of longitude is ſometimes found by obſerving the immerſions and emerſions of the firſt of Jupiter's ſatellites. The immerſions are obſerved from the time of Jupiter's being in conjunction with the ſun to his oppoſition; and the emerſion, from the oppoſition to the conjunction; which two intervals are uſually ſix months a-piece, and divide the year between them. But when Jupiter is in conjunction with the ſun, and 15 days before and afterwards, there is nothing to be obſerved; the planet, with his ſatellites, being then loſt in the light of the ſun.

Emersion is alſo uſed when a ſtar, before hid by the ſun, as being too near him, begins to re-appear, and to get out of his rays.

EMERSON (William), a late eminent mathematician, was born in June 1701, at Hurworth, a village about three miles ſouth of Darlington; at leaſt it is certain that he reſided here from his childhood. His father Dudley Emerſon was a tolerable proficient in mathematics; and without his books and inſtructions, perhaps his own genius (moſt eminently fitted for mathematical diſquiſitions) would have never been unfolded. He was inſtructed in the learned languages by a young clergyman, then curate of Hurworth, who was boarded at his father's houſe. In the earlier part of his life he attempted to teach a few ſcholars: but whether from his conciſe method (for he was not happy in explaining his ideas), or the warmth of his natural temper, he made no progreſs in his ſchool: he therefore ſoon left it off; and ſatisfied with a moderate competence left him by his parents, he devoted himſelf to a ſtudious retirement. Towards the cloſe of the year 1781 (being ſenſible of his approaching diſſolution), he diſpoſed of the whole of his mathematical library to a bookſeller at York; and on May 20th 1782, he died of a lingering and painful diſorder at his native village, aged near 81 years.

Mr Emerſon in his perſon was rather ſhort, but ſtrong and well-made, with an open countenance and ruddy complexion. He was exceedingly ſingular in his dreſs. He had but one coat, which he always wore open before, except the lower button; no waiſtcoat; his ſhirt quite the reverſe of one in common uſe, no opening before, but buttoned cloſe at the collar behind; a kind of flaxen wig which had not a crooked hair in it, and probably had never been tortured with a comb from the time of its being made. He always walked up to London when he had any thing to publiſh, reviſing ſheet by ſheet himſelf:—Truſting no eyes but his own, was always a favourite maxim with him. He never advanced any mathematical propoſition that he had not firſt tried in practice, conſtantly making all the different parts himſelf on a ſmall ſcale, ſo that his houſe was filled with all kinds of mechanical inſtruments together or disjointed. He would frequently ſtand up to his middle in water while fiſhing, a diverſion he was remarkably fond of. He uſed to ſtudy inceſſantly for ſome time, and then for relaxation take a ramble to any pot-alehouſe where he could get any body to drink with and talk to. The duke of Mancheſter was highly pleaſed with his company, and uſed often to come to him in the fields and accompany him home, but could never perſuade him to get into a carriage. On theſe occaſions he would ſometimes exclaim, "Damn your whim-wham! I had rather walk." He was a married man; and his wife uſed to ſpin on an old-faſhioned wheel, whereof a very accurate drawing is given in his mechanics. He was deeply ſkilled in the ſcience of muſic, the theory of ſounds, and the various ſcales both ancient and modern, but was a very poor performer.

The following is a liſt of Mr Emerſon's works. 1. The Doctrine of Fluxions. 2. The Projection of the Sphere, orthographic, ſtereographic, and gnomonical. 3. The Elements of Trigonometry. 4. The Principles of Mechanics. 5. A Treatiſe of Navigation on the Sea. 6. A Treatiſe of Algebra, in two books. 7. The Arithmetic of Infinites, and the differential Method, illuſtrated by Examples. 8. Mechanics; or the Doctrine of Motion. 9. The Elements of Optics, in four books. 10. A Syſtem of Aſtronomy. 11. The

11. The Laws of Centripetal and Centrifugal Force. 12. The Mathematical Principles of Geography. 13. Tracts, 8vo. 14. Cyclomatheſis; or an eaſy Introduction to the ſeveral Branches of the Mathematics. 15. A ſhort Comment on Sir Iſaac Newton's Principia; to which is added, A Defence of Sir Iſaac againſt the Objections that have been made to ſeveral Parts of his Works. 16. A Miſcellaneous Treatiſe, containing ſeveral Mathematical Subjects, 8vo. 1776.

EMERY, in natural hiſtory, a rich iron-ore found in large maſſes of no determinate ſhape or ſize, extremely hard, and very heavy. It is uſually of a duſky browniſh red on the ſurface; but when broken, is of a fine bright iron-grey, but not without ſome tinge of redneſs; and is ſpangled all over with ſhining ſpecks, which are ſmall flakes of a foliaceous talk, highly impregnated with iron. It is alſo ſometimes very red, and then uſually contains veins of gold. It makes no effervеſcence with any of the acid menſtruums; and is found in the iſland of Guernſey, in Tuſcany, and many parts of Germany.

*Com.* 7. Dr Lewis is of opinion, that ſome kinds of emery may contain the metal called *platina*, and on this ſubject has the following curious obſervations. ‘ Alonſo Barba mentions a ſubſtance called *chumpi;* which is a hard ſtone of the emery kind, participating of iron, of a grey colour ſhining a little, very hard to work, becauſe it reſiſts the fire much, found in Potoſi, Chocaya, and other places, along with blackiſh and reddiſh ores that yield gold. If platina is really found in large maſſes, either generally or only now and then, one might reaſonably expect thoſe maſſes to be ſuch as are here deſcribed.

“ Of the ſame kind perhaps alſo is the mineral mentioned by ſeveral authors under the name of Spaniſh emery, *ſmiris Hiſpanica*, which ſhould ſeem, from the accounts given of it, to be no other than platina or its matrix. The *ſmiris* is ſaid to be found in the gold mines, and its exportation prohibited; to contain films or veins of native gold; to be in great requeſt among the alchemiſts; to have been ſometimes uſed for the adulteration of gold; to ſtand, equally with the noble metal, cupellation, quartation, antimony, and the regal cement; and to be ſeparable from it by amalgamation with mercury, which throws out the *ſmiris* and retains the gold; properties ſtrongly characteriſtic of platina, and which do not belong to any known ſubſtance beſides. This debaſement of gold *per extractum ſmiridis Hiſpanici* is mentioned by Becher in his *Minera arenaria*, and ſeveral times hinted at in his *Phyſica ſubterranea*. Both Becher and Stahl indeed call the ſubſtance which the gold receives from the emery an earth, whereas platina is undoubtedly a metal; but this does not at all invalidate our ſuppoſition, for they give the name of earth alſo to the ſubſtance which copper receives from calamine in being made into braſs, which is now known to be metallic.

“ From theſe obſervations I have been led to ſuſpect, that the European emeries likewiſe might poſſibly participate of platina. If this was certain, it would account ſatisfactorily for the uſe which ſome of the alchemiſts are ſaid to have made of emeries and other ferrugineous ores; and we ſhould no longer doubt, or wonder, that by treating gold with theſe kinds of minerals, they obtained a permanent augmentation; that this augmentation, though it reſiſted lead, antimony, aquafortis, and the regal cement, was ſeparable, as Becher owns it was, by quickſilver; and that, when it exceeded certain limits, it rendered the gold pale and brittle.

“ If emery contains platina, I imagined it might be diſcoverable by boiling the powdered mineral in melted lead, and afterwards working off the lead upon a teſt or cupel. The experiment was made with eight ounces of the fineſt powder of common emery, and the ſame quantity of lead; which were covered with black flux to prevent the ſcorification of the lead, and urged with a ſtrong fire for two or three hours. The lead became hard, rigid, of a dark colour, and a granulated texture, as if it had really imbibed ſome platina from the emery; but in cupellation it worked almoſt entirely off, leaving only a bead about the ſize of a ſmall pin's head, which was probably no other than ſilver contained in the lead.

“ I repeated the experiment with ſome variation, thinking to obtain a more perfect reſolution of the emery by vitrifying it with the lead. Two ounces of fine emery and ſix ounces of minium were well mixed together, and urged with a ſtrong fire, in a cloſe crucible, for an hour: they melted into an uniform dark browniſh glaſs. The glaſs was powdered, mixed with four ounces of fixt alkaline ſalt and ſome powdered charcoal, and put into a freſh crucible, with ſome common ſalt on the ſurface: The fire was pretty ſtrongly excited; but the fuſion was not ſo perfect as could be wiſhed, and only about two ounces of lead were found revived. This lead had ſuffered nearly the ſame change as that in the foregoing experiment; and, like it, gave no appearance of platina on being cupelled.

“ It ſeems to follow from theſe experiments, that the emery employed in them contained no platina; but as it is not to be ſuppoſed that all emeries are of one compoſition, other ſorts may deſerve to be ſubmitted to the ſame trials. As gold is contained in ſome parcels of common minerals, and by no means in all the individuals of any one ſpecies; platina may poſſibly in like manner be found in ſome European ores, though there is not the leaſt footſtep of it in other parcels of the ſame kind of ore.”

EMETICS, medicines that induce vomiting.

EMIMS, ancient inhabitants of the land of Canaan beyond Jordan, who were defeated by Chedorlaomer and his allies, Gen. xiv. 5. Moſes tells us, that they were beaten in Shaveh Kirjathaim, which was in the country of Sihon conquered from the Moabites, Joſh. xiii. 19—21. The Emims were a warlike people, of a gigantic ſtature, great and many, and tall as the Anakims.

EMINENCE, in geography, a little hillock or aſcent above the level of the adjoining champaign.

Eminence is alſo a title of honour given to cardinals. The decree of the pope, whereby it was appointed that the cardinals ſhould be addreſſed under the quality of *eminence*, bears date the 10th of January 1630. They then laid aſide the titles of *illuſtriſſimi*, and *reverendiſſimi*, which they had borne before.

The grand maſter of Malta is likewiſe addreſſed under the quality of *eminence*. The popes John VIII. and Gregory VII. gave the ſame title to the kings of France. The emperors have likewiſe borne it.

*Eminentiſſimus*, the ſuperlative of *eminent*, has of late been attributed to the cardinals.

EMIR, a title of dignity among the Turks, ſignifying a prince.

This title was firſt given to the caliphs; but when they aſſumed the title of Sultans, that of emir remained to their children; as that of Cæſar among the Romans. At length the title came to be attributed to all who were judged to deſcend from Mahomet by his daughter Fatimah, and who wear the green turban inſtead of the white. The Turks make an obſervation, that the emirs, before their fortieth year, are men of the greateſt gravity, learning, and wiſdom; but after this, if they are not great fools, they diſcover ſome ſigns of levity and ſtupidity. This is interpreted by the Turks as a ſort of divine impulſe in token of their birth and ſanctity. The Turks alſo call the vizirs, baſhaws, or governors of provinces, by this name.

EMISSARY, in a political ſenſe, a perſon employed by another to ſound the opinions of people, ſpread certain reports, or act as a ſpy over other people's actions.

*Emissary-Veſſels*, in anatomy, the ſame with thoſe more commonly called Excretory.

EMISSION, in medicine, a term uſed chiefly to denote the ejaculation of the ſemen or ſeed in the act of coition. See Coition, and Generation.

EMMANUEL, or Immanuel, a Hebrew word which ſignifies, 'God with us.' Iſaiah (viii. 14.), in that celebrated prophecy, wherein he declares to Ahaz the birth of the Meſſiah, who was to be born of a virgin, ſays, This child ſhall be called, and really be, Emmanuel, that is, *God with us*. The ſame prophet (viii. 8.) repeats the ſame thing, while he is ſpeaking of the enemy's army, which, like a torrent, was to overflow Judea. 'The ſtretching out of his wings ſhall fill the breadth of thy land, O Emmanuel.' The evangeliſt Matthew (i. 23.) informs us, that this prophecy was accompliſhed in the birth of Chriſt, born of the virgin Mary, in whom the two natures divine and human were united, and ſo in this ſenſe he was really Emmanuel, or 'God with us.'

EMMERICK, a rich fortified town of Germany, in the circle of Weſtphalia, and duchy of Cleves. It carries on a good trade with the Dutch, and both Proteſtants and Catholics have the free exerciſe of their religion. The ſtreets are neat and regular, and the houſes tolerably built. It was taken by the French in 1672, and delivered to the elector of Brandenburgh in 1673, under whoſe juriſdiction it now is. It is ſeated near the Rhine. E. Long. 5. 29. N. Lat. 52. 5.

EMMIUS (Ubbo), born at Gretha in Eaſt Frieſland in 1547, was a very learned profeſſor, and choſen rector of the college of Norden in 1579. This ſeminary flouriſhed exceedingly under his care; and declined as viſibly after he was ejected, in 1587, for refuſing to ſubſcribe the Confeſſion of Augſburg. The year after, he was made rector of the college of Leer; and when the city of Groningen confederated with the United Provinces, the magiſtrates appointed him rector of that college: which employment he filled with the higheſt repute near 20 years; until, the college being erected into an univerſity, he was the firſt rector, and one of the chief ornaments of it by his lectures, till his infirmities prevented his public appearance. His wiſdom was equal to his learning; ſo that the governor of Frieſland and Groningen often conſulted him, and ſeldom failed to follow his advice. He wrote *Vetus Græcia illuſtrata*, 3 vols; *Decades Rerum Freſicarum*; and many other valuable works. He died in 1625.

EMMENAGOGUES, Εμμηναγωγα, in medicine, ſuch remedies as promote the menſtrual diſcharge. They are thus called from εν "in," μην "month," αγω *duco*, "I lead," becauſe their natural periods of flowing are once a-month.

EMOLLIENTS, in medicine and pharmacy, are ſuch remedies as ſheath and ſoften the aſperity of the humours, and relax and ſupple the ſolids at the ſame time.

EMOLUMENT, is properly applied to the profits ariſing daily from an office or employ. The word is formed of the Latin *emolumentum*, which according to ſome, primarily ſignifies the profits redounding to the miller from his mill; of *molo, molere*, "to grind."—The patent, or other inſtrument, whereby a perſon is preferred to an office, gives him a right to enjoy all the dues, honours, profits, and emoluments belonging thereto.—*Emolument* is alſo uſed, in a ſomewhat greater latitude, for profit or advantage in the general.

EMOTION and Passion, in the human mind, are thus diſtinguiſhed by a celebrated writer*. An internal motion or agitation of the mind, when it paſſeth away without deſire, is denominated *an emotion*: when deſire follows, the motion or agitation is denominated *a paſſion*. A fine face, for example, raiſeth in me a pleaſant feeling: if that feeling vaniſh without producing any effect, it is in proper language an *emotion*; but if the feeling, by reiterated views of the object, becomes ſufficiently ſtrong to occaſion deſire, it loſes its name of emotion, and acquires that of *paſſion*. The ſame holds in all the other paſſions. The painful feeling raiſed in a ſpectator by a ſlight injury done to a ſtranger, being accompanied with no deſire of revenge, is termed an emotion; but that injury raiſeth in the ſtranger a ſtronger emotion, which being accompanied with deſire of revenge, is a paſſion. External expreſſions of diſtreſs produce in the ſpectator a painful feeling, which being ſometimes ſo ſlight as to paſs away without any effect, is an emotion; but if the feeling be ſo ſtrong as to prompt deſire of affording relief, it is a paſſion, and is termed *pity*. Envy is emulation in exceſs: if the exaltation of a competitor be barely diſagreeable, the painful feeling is an emotion; if it produce deſire to depreſs him, it is a paſſion. See Passion.

EMOUY, or Hia-men, an iſland and port of China, under the juriſdiction of the province of Fo-kien.

The port is properly but an anchoring-place for ſhips, incloſed on one ſide by the iſland from which it takes its name, and on the other by the main-land: but it is ſo extenſive, that it can contain ſeveral thouſands of veſſels; and the depth of its water is ſo great, that the largeſt ſhips may lie cloſe to the ſhore without danger.

In the beginning of the preſent century it was much frequented by European veſſels; but few viſit it at preſent, as all the trade is carried on at Canton. The emperor keeps here a garriſon of 6 or 7000 men, commanded by a Chineſe general. In entering this road,

* *Elem Critici* vol. i.

road, a large rock muſt be doubled which ſtands at the mouth of it, and divides it almoſt as the Mingant divides the harbour of Breſt. This rock is viſible, and riſes ſeveral feet above the ſurface of the water.

The iſland of Emouy is particularly celebrated on account of the magnificence of its principal pagod, conſecrated to the deity Fo. This temple is ſituated in a plain, terminated on one ſide by the ſea, and on the other by a lofty mountain. Before it the ſea, flowing through different channels, forms a large ſheet of water which is bordered with turf of the moſt beautiful verdure. The front of this edifice is 180 feet in length, and its gate is adorned with figures in relief, which are the uſual ornaments of the Chineſe architecture. On entering, you find a vaſt portico, with an altar in the middle, on which is placed a gigantic ſtatue of gilt braſs, repreſenting the god Fo, ſitting croſs-legged. Four other ſtatues are placed at the corners of this portico, which are 18 feet high, although they repreſent people ſitting. Each of theſe ſtatues is formed from a ſingle block of ſtone. They bear in their hands different ſymbols which mark their attributes, as formerly in Athens and Rome the trident and caduceus diſtinguiſhed Neptune and Mercury. One holds a ſerpent in its arms, which is twiſted round its body in ſeveral folds; the ſecond has a bent bow and a quiver; the two others preſent, one a kind of battle-axe, and the other a guitar, or ſome inſtrument of the ſame kind.

After croſſing this portico, you enter a ſquare outer court, paved with large gray ſtones, the leaſt of which is ten feet in length and four in breadth. At the four ſides of this court ariſe four pavilions, which terminate in domes, and have a communication with one another by means of a gallery which runs quite round it. One of theſe contains a bell ten feet in diameter; the wooden-work which ſupports this heavy maſs cannot be ſufficiently admired. In the other is kept a drum of an enormous ſize, which the bonzes uſe to proclaim the days of new and full moon. It muſt be obſerved, that the clappers of the Chineſe bells are on the outſide, and made of wood in the form of a mallet. The two other pavilions contain the ornaments of the temple, and often ſerve to lodge travellers, whom the bonzes are obliged to receive. In the middle of this court is a large tower, which ſtands by itſelf, and terminates alſo in a dome, to which you aſcend by a beautiful ſtone ſtair-caſe that winds round it. This dome contains a temple remarkably neat; the ceiling is ornamented with moſaic work, and the walls are covered with ſtone figures in relief, repreſenting animals and monſters. The pillars which ſupport the roof of this edifice are of wood varniſhed; and on feſtivals are ornamented with ſmall flags of different colours. The pavement of the temple is formed of little ſhells, and its different compartments preſent birds, butterflies, flowers, &c.

The bonzes continually burn incenſe upon the altar, and keep the lamps lighted, which hang from the ceiling of the temple. At one extremity of the altar ſtands a brazen urn, which when ſtruck ſends forth a mournful ſound: on the oppoſite ſide is a hollow machine of wood, of an oval form, uſed for the ſame purpoſe, which is to accompany with its ſound their voices when they ſing in praiſe of the tutelary idol of the pagod. The god Pouſſa is placed on the middle of this altar, on a flower of gilt braſs, which ſerves as a baſe, and holds a young child in his arms; ſeveral idols, which are no doubt ſubaltern deities, are ranged around him, and ſhow by their attitudes their reſpect and veneration.

The bonzes have traced out on the walls of this temple ſeveral hierogliphical characters in praiſe of Pouſſa; there is alſo to be ſeen an hiſtorical or allegorical painting in freſco, which repreſents a burning lake, in which ſeveral men appear to be ſwimming, ſome carried by monſters, others ſurrounded by dragons and winged ſerpents. In the middle of the gulph riſes a ſteep rock, on the top of which the god is ſeated, holding in his arms a child, who ſeems to call out to thoſe who are in the flames of the lake; but an old man, with hanging ears and horns on his head, prevents them from climbing to the ſummit of the rock, and threatens to drive them back with a large club. The bonzes are at a loſs what anſwer to give, when any queſtions are aſked them concerning this painting. Behind the altar is a kind of library, containing books which treat of the worſhip of idols.

On deſcending from this dome you croſs the court, and enter a kind of gallery, the walls of which are lined with boards; it contains 24 ſtatues of gilt braſs, repreſenting the ſame number of philoſophers, ancient diſciples of Confucius. At the end of this gallery you find a large hall, which is the refectory of the bonzes; and after having traverſed a ſpacious apartment, you at length enter the temple of Fo, to which there is an aſcent by a large ſtone ſtair-caſe. It is ornamented with vaſes full of artificial flowers (a work in which the Chineſe excel); and here alſo are found the ſame kind of muſical inſtruments as thoſe mentioned before. The ſtatue of the god is not to be ſeen but through a piece of black gauze, which forms a kind of veil or curtain before the altar. The reſt of the pagod conſiſts of ſeveral large chambers, exceedingly neat, but badly diſpoſed; the gardens and pleaſure grounds are on the declivity of the mountain; and a number of delightful grottos are cut out in the rock, which afford an agreeable ſhelter from the exceſſive heat of the ſun.

There are ſeveral other pagods in the iſle of Emouy; among which is one called *The Pagod of the Ten Thouſand Stones*, becauſe it is built on the brow of a mountain where there is a like number of little rocks, under which the bonzes have formed grottos and very pleaſant covered ſeats. A certain rural ſimplicity reigns here, which captivates and delights.

Strangers are received by theſe bonzes with great politeneſs, and may freely enter their temples; but they muſt not attempt to gratify their curioſity fully, nor to enter thoſe apartments into which they are not introduced, eſpecially if they are accompanied by ſuſpicious perſons; for the bonzes, who are forbid under pain of ſevere puniſhment to have any intercourſe with women, and who often keep them in private, might, from fear of being diſcovered, revenge themſelves for too impertinent a curioſity.

EMPALEMENT, an ancient kind of puniſhment, which conſiſted in thruſting a ſtake up the fundament. The word comes from the French *empaler*, or the Italian *impalare*; or rather, they are all alike derived from the Latin *palus* "a ſtake," and the prepoſition *in*, "in or into." We find mention of empaling in Juvenal. It was frequently practiſed in the time of Nero, and continues to be ſo in Turkey.

*Empalement of a Flower*, the ſame with Calyx.

EMPANELLING. See Impanelling.

EMPARLANCE. See Imparlance.

EMPEDOCLES, a celebrated philoſopher and poet, was born at Agrigentum, a city in Sicily. He followed the Pythagorean philoſophy, and admitted the metemſychoſis. He conſtantly appeared with a crown of gold on his head; to maintain, by this outward pomp, the reputation he had acquired of being a very extraordinary man. Yet Ariſtotle ſays, that he was a great lover of liberty, extremely averſe to ſtate and command, and that he even refuſed a kingdom that was offered him. His principal work was a Treatiſe in verſe on the Nature and Principles of Things. Ariſtotle, Lucretius, and all the ancients, make the moſt magnificent elogiums on his poetry and eloquence.

He taught rhetoric; and often alleviated the anxieties of his mind, as well as the pains of his body, with muſic. It is reported, that his curioſity to viſit the flames of the crater of Ætna proved fatal to him. Some maintain that he wiſhed it to be believed that he was a god; and that his death might be unknown, he threw himſelf into the crater and periſhed in the flames. His expectations, however, were fruſtrated; and the volcano by throwing up one of his ſandals diſcovered to the world that Empedocles had periſhed by fire. Others report that he lived to an extreme old age; and that he was drowned in the ſea about 440 years before the Chriſtian era.

EMPEROR *(imperator)*, among the ancient Romans, ſignified a general of an army, who, for ſome extraordinary ſucceſs, had been complimented with this appellation. Thus Auguſtus, having obtained no leſs than twenty famous victories, was as often ſaluted with the title *emperor*; and Titus was denominated *emperor* by his army after the reduction of Jeruſalem.

Afterwards, it came to denominate an abſolute monarch or ſupreme commander of an empire. In this ſenſe Julius Cæſar was called *emperor*: the ſame title deſcended with the dignity to Octavius, Auguſtus, Tiberius, and Caligula; and afterwards it became elective.

In ſtrictneſs, the title *emperor* does not, and cannot, add any thing to the rights of ſovereignty: its effect is only to give precedence and pre-eminence above other ſovereigns; and as ſuch, it raiſes thoſe inveſted with it to the ſummit of all human greatneſs.

It is diſputed, whether or not emperors have the power of diſpoſing of the regal title. It is true, they have ſometimes taken upon them to erect kingdoms; and thus it is that Bohemia and Poland are ſaid to have been raiſed to the dignity: thus alſo, the emperor Charles the Bald, in the year 877, gave Provence to Boſon, putting the diadem on his head, and decreeing him to be called "king," *ut more priſcorum imperatorum regibus videretur dominari.* Add, that the emperor Leopold erected the ducal Pruſſia into a kingdom in favour of the elector of Brandenburg; and though ſeveral of the kings of Europe refuſed for ſome time to acknowledge him in that capacity, yet by the treaty of Utrecht in 1712 they all came in.

In the Eaſt, the title and quality of emperor are more frequent than they are among us; thus, the ſovereign princes of China, Japan, Mogul, Perſia, &c. are all emperors of China, Japan, &c. In the year 1723, the czar of Muſcovy aſſumed the title of *emperor of all Ruſſia*, and procured himſelf to be recognized as ſuch by moſt of the princes and ſtates of Europe.

In the Weſt, the title has been a long time reſtrained to the emperors of Germany. The firſt who bore it was Charlemagne, who had the title of emperor conferred on him by Pope Leo III. though he had all the power before. The imperial prerogatives were formerly much more extenſive than they are at preſent. At the cloſe of the Saxon race, A. D. 1024, they exerciſed the right of conferring all the eccleſiaſtical benefices in Germany; of receiving the revenues of them during a vacancy; of ſucceeding to the effects of inteſtate eccleſiaſtics; of confirming or annulling the elections of the popes; of aſſembling councils, and of appointing them to decide concerning the affairs of the church; of conferring the title of king on their vaſſals; of granting vacant fiefs; of receiving the revenues of the empire; of governing Italy as its proper ſovereigns; of erecting free cities, and eſtabliſhing fairs in them; of aſſembling the diets of the empire, and fixing the time of their duration; of coining money, and conferring the ſame privilege on the ſtates of the empire; and of adminiſtering both high and low juſtice within the territories of the different ſtates: but in the year 1437, they were reduced to the right of conferring all dignities and titles, except the privilege of being a ſtate of the empire; of *preces primariæ*, or of appointing once during their reign a dignitary in each chapter or religious houſe; of granting diſpenſations with reſpect to the age of majority; of erecting cities, and conferring the privilege of coining money; of calling the meetings of the diet, and preſiding in them.

To which ſome have added, 1. That all the princes and ſtates of Germany are obliged to do them homage, and ſwear fidelity to them. 2. That they, or their generals, have a right to command the forces of all the princes of the empire, when united together. 3. That they receive a kind of tribute from all the princes and ſtates of the empire, for carrying on a war which concerns the whole empire, which is called the *Roman month*. For the reſt, there is not a foot of land or territory annexed to his title: but ever ſince the reign of Charles IV. the emperors have depended entirely on their hereditary dominions as the only ſource of their power, and even of their ſubſiſtence. See Diet and Electors.

The kings of France were anciently alſo called emperors, at the time when they reigned with their ſons, whom they aſſociated to the crown. Thus Hugh Capet, having aſſociated his ſon Robert, took the title of emperor, and Robert that of king; under which titles they are mentioned in the Hiſtory of the Council of Rheims, by Gerbert, &c. King Robert is alſo called emperor of the French by Helgau of Fleury. Louis le Gros, upon aſſociating his ſon, did the ſame. In the Firſt Regiſter of the King's Charters, fol. 166, are found letters of Louis le Gros, dated in 1116, in favour of Raymond biſhop of Maguelonne, wherein he ſtyles himſelf, *Ludovicus, Dei ordinante providentia,*

*Fran-*

*Francorum imperator auguſtus.* The kings of England had likewiſe anciently the title of emperors, as appears from a charter of king Edgar: *Ego Edgarus Anglorum baſileus, omniumque regum inſularum oceani quæ Britanniam circumjacent, &c. imperator & dominus.*

EMPETRUM, BERRY-BEARING HEATH: A genus of the triandria order, belonging to the monœcia claſs of plants. In the natural method this genus is ranked by Linnæus under the 54th order, *Miſcellaneæ;* and likewiſe among thoſe of which the order is doubtful. The male calyx is tripartite; the corolla tripetalous; the ſtamina long; the female calyx is tripartite; the corolla tripetalous; the ſtyles nine; the berry nine-ſeeded. There are two ſpecies; one of which, viz. the nigrum, which bears the crow-crake berries, is a native of Britain. It grows wild on boggy heaths and mountains. Children ſometimes eat the berries; but, when taken in too great quantity, they are apt to occaſion a headach. Grouſe feed upon them. When boiled with alum, they afford a dark purple dye. Goats are not fond of it. Cows, ſheep, and horſes refuſe it.

EMPHASIS, in rhetoric, a particular ſtreſs of the voice and action, laid on ſuch parts or words of the oration as the orator wants to inforce upon his audience. See DECLAMATION; ORATORY, Part IV.; and READING.

EMPHYSEMA, in ſurgery, a windy tumor, generally occaſioned by a fracture of the ribs, and formed by the air inſinuating itſelf, by a ſmall wound, between the ſkin and muſcles, into the ſubſtance of the cellular or adipoſe membrane, ſpreading itſelf afterwards up to the neck, head, belly, and other parts, much after the manner in which butchers blow up their veal.

EMPIRE *(imperium)*, in political geography, a large extent of land, under the juriſdiction or government of an emperor. See EMPEROR.

In ancient hiſtory we read of four great monarchies or empires, viz. that of the Babylonians, Chaldeans, and Aſſyrians; that of the Medes and Perſians; that of the Greeks; and that of the Romans. The firſt ſubſiſted from the time of Nimrod, who founded it in the year of the world 1800, according to the computation of Uſher, to Sardanapalus their laſt king in 3257, and conſequently laſted above 1450 years. The empire of the Medes commenced under Arbace, in the year of the world 3257, and was united to that of the Babylonians and Perſians under Cyrus, in the 3468, and it cloſed with the death of Darius Codomannus in 3674. The Grecian empire laſted only during the reign of Alexander the Great, beginning in the year of the world 3674, and terminating with the death of this conqueror in 3681, his conqueſts being divided among his captains. The Roman empire commenced with Julius Cæſar, when he was made perpetual dictator, in the year of the city 708, and of the world 3956, 48 years after Chriſt. The ſeat of the empire was removed to Byzantium by Conſtantine, in the year of our Lord 334; the eaſt and weſt were then united under the title of the Roman empire, till the Romans proclaimed Charlemagne emperor, A. D. 800. From this epocha the eaſt and weſt formed two ſeparate empires; that of the eaſt, governed by Greek emperors, commenced A. D. 802: and being gradually weakened, terminated under Conſtantine Palæologus in 1453. The weſtern empire was afterwards known by the appellation of the empire or German empire.

Antiquaries diſtinguiſh between the medals of the *upper*, and *lower* or *bas, empire.*—The curious only value thoſe of the upper empire, which commences with Cæſar or Auguſtus, and ends in the year of Chriſt 260. The lower empire comprehends near 1200 years, reckoning down to the deſtruction of Conſtantinople in 1453.—They uſually diſtinguiſh two ages, or periods, of the lower empire: the firſt beginning where the upper ends, viz. with Aurelian, and ending with Anaſtaſius, including 200 years; the ſecond beginning with Anaſtaſius, and ending with the Palæologi, which includes 1000 years.

*EMPIRE*, or *The empire*, uſed abſolutely and without any addition, ſignifies the empire of Germany; called alſo, in juridical acts and laws, The holy Roman empire. It had its beginning with the ninth century; Charlemagne being created firſt emperor by Pope Leo III. who put the crown on his head in St Peter's church on Chriſtmas-day in the year 800.

Authors are at a loſs under what form of government to range the empire. Some of them maintain it to be a monarchical ſtate, becauſe all the members thereof are obliged to aſk the inveſtiture of their ſtates of the emperor, and to take an oath of fidelity to him. Others conſider it as a republic, or ariſtocratic ſtate, becauſe the emperor cannot reſolve or determine any thing without the concurring ſuffrages of the princes. It is added, that if they require inveſtiture from, and ſwear fealty to him, it is only as head of the republic, and in the name of the republic, and not in his own; juſt as at Venice every thing is tranſacted in name of the doge. Others will have the empire to be a monarcho-ariſtocratic ſtate, *i. e.* a mixture of monarchy and ariſtocracy; becauſe, though the emperor in many caſes ſeems to act ſovereignly, yet his decrees and reſolves have no force, in caſe the ſtate refuſe to confirm them. Laſtly, it has been called an ariſto-democratic ſtate, becauſe the diet, wherein the ſovereignty is lodged, is compoſed of princes and the deputies of the cities; and is divided into three orders or bodies, called *colleges*, viz. the college of electors, the college of princes, and the college of cities.

We ſay, diet of the empire, circles of the empire, fiefs of the empire, princes of the empire, eſtates of the empire, members of the empire, capitulations of the empire. See DIET, CIRCLE, PRINCE, CAPITULATION, &c.

The ſtates or eſtates of the empire are of two kinds, mediate and immediate. The immediate ſtates are thoſe who hold immediately of the empire: Whereof, again, there are two kinds; the firſt, ſuch as have ſeats and voices in the imperial diet; the ſecond, ſuch as have none. The mediate ſtates are thoſe who hold of the immediate.

The ſtates which now compoſe the empire are, The princes of the empire, the counts of the empire, the free barons of the empire, the prelates of the empire, the princeſſes or abbeſſes of the empire, the nobles of the empire, and the imperial cities.

EMPIRIC, an appellation given to thoſe phyſicians who conduct themſelves wholly by their own experience, without ſtudying phyſic in a regular way.

Some even uſe the term, in a ſtill worſe ſenſe, for a quack who preſcribes at random, without being at all acquainted with the principles of the art.

EMPIS, in zoology, a genus of inſects belonging to the order Diptera; of which the characters are theſe: The proboſcis is of an horny ſubſtance, bivalve, reflexed under the head and breaſt, and longer than the thorax. See a ſpecimen on Plate CLXXXII.

EMPLASTER. See PLASTER.

EMPORIÆ, a double city of the Hither Spain, near the Pyrenees; ſeparated by a wall; one part occupied by the Greeks of Phocæa, whence originally are the Maſſilienſes; the other, by native Spaniards, to whom was added by Auguſtus a Roman colony. Now Ampurias, in Catalonia. E. Long. 2. 50. N. Lat. 42. 15.

EMPORIUM, in medicine, is often uſed for the common ſenſory in the brain. See BRAIN.

EMPORIUM, (anc. geog.), two cities near Placentia; one well fortified, and guarded by a ſtrong garriſon, at which Hannibal met a repulſe: the other, Hannibal took and plundered. Now thought to be Ponte Nura, in the duchy of Placentia.

EMPRESS, the ſpouſe of an emperor, or a woman who governs an empire. See EMPEROR.

EMPROSTHOTONOS, a ſpecies of convulſion, wherein the head bends forward.

EMPYÆMA, in medicine, a diſorder wherein purulent matter is contained in the thorax or breaſt, after an inflammation and ſuppuration of the lungs and pleura. See MEDICINE-*Index*.

EMPYREAL AIR. So Dr Higgens denominates that which Dr Prieſtley calls *dephlogiſticated* air, and other philoſophers *vital* or *pure* air.

EMPYREUM, a term uſed by divines for the higheſt heaven, where the bleſſed enjoy the beatific viſion. The word is formed of εν and πυρ *fire*, becauſe of its ſplendor.

EMPYREUMA, in chemiſtry, ſignifies a very diſagreeable ſmell produced from burnt oils. It is often perceived in diſtillations of animal as well as vegetable ſubſtances when they are expoſed to a quick fire.

EMRODS. See HEMORRHOIDS.

EMULATION, a generous ardor kindled by the praiſe-worthy examples of others, which impels us to imitate, to rival, and, if poſſible, to excel them. This paſſion involves in it eſteem of the perſon whoſe attainments or conduct we emulate, of the qualities and actions in which we emulate him, and a deſire of reſemblance, together with a joy ſpringing from the hope of ſucceſs. The word comes originally from the Greek αμιλλα, *diſpute, conteſt*; whence the Latin, *æmulus*, and thence our *emulation*.

Plato obſerves of emulation, that it is the daughter of envy; if ſo, there is a great difference between the mother and the offſpring; the one is a virtue and the other a vice. Emulation admires great actions, and ſtrives to imitate them; envy refuſes them the praiſes that are their due; emulation is generous, and only thinks of ſurpaſſing a rival; envy is low, and only ſeeks to leſſen him. Perhaps, therefore, it would be more juſt to ſuppoſe emulation the daughter of admiration: admiration, however, is a principal ingredient in the compoſition of it.

EMULGENT, or RENAL, ARTERIES, thoſe which ſupply the kidneys with blood; being ſometimes ſingle, ſometimes double, on each ſide. See ANATOMY, nº 23.

EMULSION, a ſoft liquid remedy, of a colour and conſiſtence reſembling milk. See PHARMACY.

EMUNCTORY, in anatomy, a general term for all thoſe parts which ſerve to carry off the excrementitious parts of the blood and other humours of the body. Such more eſpecially are the kidneys, bladder, and moſt of the glands.

ENALLAGE, in grammar, is when one word is ſubſtituted for another of the ſame part of ſpeech: A ſubſtantive for an adjective; as *exercitus victor*, for *victorioſus*; *ſcelus*, for *ſceleſtus*: A primitive for a derivative; as *Dardana arma*, for *Dardania*: An active for a paſſive; as *nox humida cœlo præcipitat*, for *precipitatur*, &c.

ENAMEL, in general, is a vitrified matter betwixt the parts of which is diſperſed ſome unvitrified matter: hence enamel ought to have all the properties of glaſs except tranſparency.

Enamels have for their baſis a pure cryſtal glaſs or frit, ground up with a fine calx of lead and tin prepared for the purpoſe, with the addition uſually of white ſalt of tartar. Theſe ingredients baked together are the matter of all enamels, which are made by adding colours of this or that kind in powder to this matter, and melting or incorporating them together in a furnace.

For white enamel, Neri *(De Arte Vitriar.)* directs only mangane ſe to be added to the matter which conſtitutes the baſis. For azure, zaffer mixed with calx of braſs. For green, calx of braſs with ſcales of iron, or with crocus martis. For black, zaffer with mangane ſe or with crocus martis; or mangane ſe with tartar. For red, mangane ſe, or calx of copper and red tartar. For purple, mangane ſe with calx of braſs. For yellow, tartar and mangane ſe. And for violet-coloured enamel, mangane ſe with thrice-calcined braſs.

In making theſe enamels, the following general cautions are neceſſary to be obſerved. 1. That the pots muſt be glazed with white glaſs, and muſt be ſuch as will bear the fire. 2. That the matter of enamels muſt be very nicely mixed with the colours. 3. When the enamel is good, and the colour well incorporated, it muſt be taken from the fire with a pair of tongs. 4. The general way of making the coloured enamel is this: Powder, ſift, and grind, all the colours very nicely, and firſt mix them with one another, and then with the common matter of enamels: then ſet them in pots in a furnace; and when they are well mixed and incorporated, caſt them into water; and when dry, ſet them in a furnace again to melt; and when melted, take a proof of it. If too deep-coloured, add more of the common matter of enamels; and if too pale, add more of the colours.

Enamels are uſed either in counterfeiting or imitating precious ſtones, in painting in enamel; or by enamellers, jewellers, and goldſmiths, in gold, ſilver, and other metals. The two firſt kinds are uſually prepared by the workmen themſelves, who are employed in theſe arts. That uſed by jewellers, &c. is brought to us chiefly from Venice or Holland, in little cakes of different ſizes, commonly about four inches diameter, having the mark of the maker ſtuck upon it with a puncheon. It pays 1 s. $7\frac{41}{100}$d. the pound on importation,

tation, and draws back 1 s. $5\frac{70}{100}$d. at the rate of 4 s. per pound.

ENAMELLING, the art of laying enamel upon metals, as gold, ſilver, copper, &c. and of melting it at the fire, or of making divers curious works in it at a lamp. It ſignifies alſo to paint in enamel.

*The method of painting in* ENAMEL. This is performed on plates of gold or ſilver, and moſt commonly of copper, enamelled with the white enamel; whereon they paint with colours which are melted in the fire, where they take a brightneſs and luſtre like that of glaſs. This painting is the moſt prized of all for its peculiar brightneſs and vivacity, which is very permanent, the force of its colours not being effaced or ſullied with time as in other painting, and continuing always as freſh as when it came out of the workmens hands. It is uſual in miniature; it being the more difficult the larger it is, by reaſon of certain accidents it is liable to in the operation. Enamelling ſhould only be practiſed on plates of gold, the other metals being leſs pure: copper, for inſtance, ſcales with the application, and yields fumes; and ſilver turns the yellow white. Nor muſt the plate be made flat; for in ſuch caſe, the enamel cracks; to avoid which, they uſually forge them a little round or oval, and not too thick. The plate being well and evenly forged, they uſually begin the operation by laying on a couch of white enamel (as we obſerved above) on both ſides, which prevents the metal from ſwelling and bliſtering; and this firſt layer ſerves for the ground of all the other colours. The plate being thus prepared, they begin at firſt by drawing out exactly the ſubject to be painted with red vitriol, mixed with oil of ſpike, marking all parts of the deſign very lightly with a ſmall pencil. After this, the colours (which are to be before ground with water in a mortar of agate extremely fine, and mixed with oil of ſpike ſomewhat thick) are to be laid on, obſerving the mixtures and colours that agree to the different parts of the ſubject; for which it is neceſſary to underſtand painting in miniature. But here the workman muſt be very cautious of the good or bad qualities of the oil of ſpike he employs to mix his colours with, for it is very ſubject to adulterations.

Great care muſt likewiſe be taken, that the leaſt duſt imaginable come not to your colours while you are either painting or grinding them; for the leaſt ſpeck, when it is worked up with it, and when the work comes to be put into the reverberatory to be red hot, will leave a hole, and ſo deface the work.

When the colours are all laid, the painting muſt be gently dried over a ſlow fire to evaporate the oil, and the colours afterwards melted to incorporate them with the enamel, making the plate red-hot in a fire like what the enamellers uſe. Afterwards that part of the painting muſt be paſſed over again which the fire hath any thing effaced, ſtrengthening the ſhades and colours, and committing it again to the fire, obſerving the ſame method as before, which is to be repeated till the work be finiſhed.

*Method of* ENAMELLING *by the Lamp.* Moſt enamelled works are wrought at the fire of a lamp, in which, inſtead of oil, they put melted horſe-greaſe, which they call *caballine oil.* The lamp, which is of copper, or white iron, conſiſts of two pieces; in one of which is a kind of oval plate, ſix inches long, and two high, in which they put the oil and the cotton. The other part, called the *box*, in which the lamp is incloſed, ſerves only to receive the oil which boils over by the force of the fire. This lamp, or, where ſeveral artiſts work together, two or three more lamps are placed on a table of proper height. Under the table, about the middle of its height, is a double pair of organ-bellows, which one of the workmen moves up and down with his foot to quicken the flame of the lamps, which are by this means excited to an incredible degree of vehemence. Grooves made with a gauge in the upper part of the table, and covered with parchment, convey the wind of the bellows to a pipe of glaſs before each lamp; and that the enamellers may not be incommoded with the heat of the lamp, every pipe is covered at ſix inches diſtance with a little tin plate, fixed into the table by a wooden handle. When the works do not require a long blaſt, they only uſe a glaſs-pipe, into which they blow with their mouth.

It is incredible to what a degree of fineneſs and delicacy the threads of enamel may be drawn at the lamp. Thoſe which are uſed in making falſe tufts of feathers are ſo fine, that they may be wound on the reel like ſilk or thread. The fictitious jets of all colours, uſed in embroideries, are alſo made of enamel; and that with ſo much art, that every ſmall piece hath its hole to paſs the thread through wherewith it is ſewed. Theſe holes are made by blowing them into long pieces; which they afterwards cut with a proper tool.

It is ſeldom that the Venetian or Dutch enamels are uſed alone: they commonly melt them in an iron-ladle, with an equal part of glaſs or cryſtal; and when the two matters are in perfect fuſion, they draw it out into threads of different ſizes, according to the nature of the work. They take it out of the ladle while liquid, with two pieces of broken tobacco-pipes, which they extend from each other at arm's length. If the thread is required ſtill longer, then another workman holds one end, and continues to draw it out, while the firſt holds the enamel to the flame. Thoſe threads, when cold, are cut into what lengths the workman thinks fit, but commonly from 10 to 12 inches; and as they are all round, if they are required to be flat, they muſt be drawn through a pair of pinchers while yet hot. They have alſo another iron inſtrument in form of pinchers, to draw out the enamel by the lamp when it is to be worked and diſpoſed in figures. Laſtly, they have glaſs-tubes of various ſizes, ſerving to blow the enamel into various figures, and preſerve the neceſſary vacancies therein; as alſo to ſpare the ſtuff, and form the contours. When the enameller is at work, he ſits before the lamp with his foot on the ſtep that moves on the bellows; and holding in his left hand the work to be enamelled, or the braſs or iron-wires the figures are to be formed on, he directs with his right the enamel thread, which he holds to the flame with a management and patience equally ſurpriſing. There are few things they cannot make or repreſent with enamel; and ſome figures are as well finiſhed, as if done by the moſt ſkilful carvers.

ENARTHROSIS, in anatomy, a ſpecies of DIARTHROSIS.

ENCÆNIA, the name of three ſeveral feaſts celebrated by the Jews in memory of the dedication, or rather purification, of the temple, by Judas Maccabæus, Solomon, and Zorobabel. This term is likewiſe uſed in church-hiſtory for the dedication of Chriſtian churches.

ENCAMPMENT, the pitching of a CAMP.

ENCANTHIS, in ſurgery, a tubercle ariſing either from the caruncula lachrymalis, or from the adjacent red ſkin; ſometimes ſo large, as to obſtruct not only the puncta lachrymalia, but alſo part of the ſight or pupil itſelf. See SURGERY.

ENCAUSTIC and ENCAUSTUM, the ſame with enamelling and enamel. See ENAMELLING and ENAMEL.

*Encaustic Painting*, a method of painting made uſe of by the ancients, in which wax was employed to give a gloſs to their colours, and to preſerve them from the injuries of the air.

This ancient art, after having been long loſt, was reſtored by Count Caylus, a member of the Academy of Inſcriptions in France; and the method of painting in wax was announced to the Academy of Painting and Belles Lettres in the year 1753; though M. Bachelier, the author of a treatiſe *De l'Hiſtoire & du Secret de la Peinture en Cire*, had actually painted a picture in wax in 1749; and he was the firſt who communicated to the public the method of performing the operation of inuſtion, which is the principal characteriſtic of the encauſtic painting. The Count kept his method a ſecret for ſome time, contenting himſelf with exhibiting a picture at the Louvre in 1754, repreſenting the head of Minerva, painted in the manner of the ancients, which excited the curioſity of the public, and was very much admired. In the interval of ſuſpence, ſeveral attempts were made to recover the ancient method of painting. The firſt ſcheme adopted was that of melting wax and oil of turpentine together, and uſing this compoſition as a vehicle for mixing and laying on the colours. But this method did not explain Pliny's meaning, as the wax is not burnt in this way of managing it. In another attempt, which was much more agreeable to the hiſtorian's deſcription of encauſtic painting, the wax was melted with ſtrong lixivium of ſalt of tartar, and with this the colours were ground. When the picture was finiſhed, it was gradually preſented to the fire, ſo as to melt the wax; which was thus diffuſed through all the particles of the colours, ſo that they were fixed to the ground, and ſecured from the acceſs of air or moiſture. But the method of count Caylus is much more ſimple: the cloth or wood, which he deſigned for the baſis of his picture, is waxed over, by only rubbing it ſimply with a piece of bees-wax; the wood or cloth, ſtretched on a frame, being held horizontally over, or perpendicularly before a fire, at ſuch a diſtance, that the wax might gradually melt, whilſt it is rubbed on, diffuſe itſelf, penetrate the body, and fill the interſtices of the texture of the cloth, which, when cool, is fit to paint upon; but as water-colours, or thoſe that are mixed up with common water, will not adhere to the wax, the whole picture is to be firſt rubbed over with Spaniſh chalk or white, and then the colours are applied to it; when the picture is dry, it is put near the fire, whereby the wax melts, and abſorbs all the colours.

Mr J. H. Muntz, in a treatiſe on this ſubject, has propoſed ſeveral improvements in the art of encauſtic painting. When the painting is on cloth, he directs it to be prepared by ſtretching it on a frame, and rubbing one ſide ſeveral times over with a piece of bees-wax, or virgin wax, till it is covered with a coat of wax of conſiderable thickneſs. In fine linen, this is the only operation neceſſary previous to painting; but coarſe cloth muſt be rubbed gently on the unwaxed ſide with a pumice ſtone, to take of all thoſe knots which would prevent the free and accurate working of the pencil. Then the ſubject is to be painted on the unwaxed ſide with colours prepared and tempered with water; and when the picture is finiſhed, it muſt be brought near the fire, that the wax may melt and fix the colours. This method, however, can only be applied to cloth or paper, through the ſubſtance of which the wax may paſs; but in wood, ſtone, metals, or plaſter, the former method of Count Caylus muſt be obſerved.

Mr Muntz has alſo diſcovered a method of forming grounds for painting with crayons, and fixing theſe, as well as water-colours, employed with the pencil. On the unwaxed ſide of a linen cloth, ſtretched and waxed as before, lay an even and thick coat of the colour proper for the ground; having prepared this colour by mixing ſome proper pigment with an equal quantity of chalk, and tempering them with water. When the colour is dry, bring the picture to the fire that the wax may melt, paſs through the cloth, and fix the ground. An additional quantity of wax may be applied to the back of the picture, if that which was firſt rubbed on ſhould not be ſufficient for the body of colour; but as this muſt be laid on without heat, the wax ſhould be diſſolved in oil of turpentine, and applied with a bruſh, and the canvas be again expoſed to the fire, that the freſh ſupply of wax may paſs through the cloth, and be abſorbed by the colour; and thus a firm and good body will be formed for working on with the crayons. If cloth and paper are joined together, the cloth muſt be firſt fixed to the ſtraining frame, and then the paper muſt be paſted to it with a compoſition of paſte made with wheaten flour, or ſtarch and water, and about a twelfth part of its weight of common turpentine. The turpentine muſt be added to the paſte when it is almoſt ſufficiently boiled, and the compoſition well ſtirred, and left to ſimmer over the fire for five or ſix minutes; let wax be diſſolved in oil of turpentine to the conſiſtence of a thin paſte; and when the cloth and paper are dry, let them be held near a fire; and with a bruſh lay a coat of the wax and turpentine on both ſides the joined cloth and paper, in ſuch a degree of thickneſs, that both ſurfaces may ſhine throughout without any appearance of dull ſpots. Then expoſe the cloth to the fire or to the ſun; by which means the oil will evaporate, and the wax become ſolid, and be fit to receive any compoſition of colour for a ground, which is to be laid on as above directed in the caſe of cloth without paper.

Almoſt all the colours that are uſed in oil-painting may be alſo applied in the encauſtic method. Mr Muntz objects, indeed, to brown, light pink, and unburnt *terra di Sienna;* becauſe theſe, on account of their gummy or ſtony texture, will not admit ſuch a coheſion with the wax as will properly fix them; but other colours which cannot be admitted in oil-painting, as red lead, red orpiment, cryſtals of verdegris, and red precipitate of mercury, may be uſed here. The crayons uſed in encauſtic painting are the ſame with thoſe uſed in the common way of crayon painting, excepting thoſe that in their compoſition are too tenacious; and the method of uſing them is the ſame in both caſes.

The encauſtic painting has many peculiar advantages: though the colours have not the natural varniſh or ſhining which they acquire with oil, they have all the ſtrength of paintings in oil, and all the airineſs of water-colours, without partaking of the apparent character or defects of either; they may be looked at in any light and in any ſituation, without any falſe glare: the colours are firm, and will bear waſhing; and a picture, after having been ſmoaked, and then expoſed to the dew, becomes as clean as if it had been but juſt painted. It may alſo be retouched at pleaſure without any detriment to the colours; for the new colours will unite with the old ones, without ſpots, as is the caſe in common ſize painting; nor is it neceſſary to rub the places to be retouched with oil as in oil pictures; it is not liable to crack, and eaſily repaired, if it ſhould chance to ſuffer any injury. The duration of this painting is alſo a very material advantage; the colours are not liable to fade and change; no damp can affect them, nor any corroſive ſubſtance injure them; nor can the colour fall off in ſhivers from the canvas. However, notwithſtanding all theſe and other advantages enumerated by the abbe Mazeas and Mr Muntz, this art has not yet been much practiſed. Many of theſe properties belong to a much higher ſpecies of encauſtic painting afterwards diſcovered in England, the colours of which are fixed by a very intenſe heat; nor are the colours or grounds on which they are laid liable to be diſſolved or corroded by any chemical menſtruum, nor, like the glaſſy colours of enamel, to run out of the drawing on the fire. What this method conſiſts in will appear from the following account communicated in a letter from Mr Joſiah Colebrooke to the earl of Macclesfield preſident of the Royal Society in 1759.

"The art of painting with burnt wax (ſays he) has long been loſt to the world. The uſe of it to painters in the infancy of the art of painting, was of the utmoſt conſequence. Drying oil being unknown, they had nothing to preſerve their colours entire from the injury of damps and the heat of the ſun: a varniſh of ſome ſort was therefore neceſſary; but they being unacquainted with diſtilled ſpirits, could not, as we now do, diſſolve gums to make a tranſparent coat for their pictures: this invention therefore of burnt wax ſupplied that defect to them; and with this manner of painting, the chambers and other rooms in their houſes were furniſhed: this Pliny calls *encauſtum*, and we *encauſtic painting*.

"The following experiments which I have the honour to lay before your Lordſhip and the Society, were occaſioned by the extract of a letter from the abbe Mazeas, tranſlated by Dr Parſons, and publiſhed in the ſecond part of the XLIXth volume of the Philoſophical Tranſactions, n° 100. concerning the ancient method of painting with burnt wax, revived by count Caylus.

"The count's method was, 1. To rub the cloth or board deſigned for the picture ſimply over with bees-wax. 2. To lay on the colours mixed with common water; but as the colours will not adhere to the wax, the whole picture was firſt rubbed over with (A) Spaniſh chalk, and then the colours are uſed. 3. When the picture is dry, it is put near the fire, whereby the wax melts, and abſorbs all the colours.

"Exp. I. A piece of oak-board was rubbed over with bees-wax, firſt againſt the grain of the wood, and then with the grain, to fill up all the pores that remained after it had been planed, and afterwards was rubbed over with as much dry Spaniſh white as could be made to ſtick on it. This, on being painted (the colours mixed with water only), ſo clogged the pencil, and mixed ſo unequally with the ground, that it was impoſſible to make even an outline, but what was ſo much thicker in one part than another, that it would not bear ſo much as the name of painting; neither had it any appearance of a picture. However, to purſue the experiment, this was put at a diſtance from the fire, on the hearth, and the wax melted by ſlow degrees: but the Spaniſh white (though laid as ſmooth as ſo ſoft a body would admit, before the colour was laid on), on melting the wax into it, was not ſufficient to hide the grain of the wood, nor ſhow the colours by a proper whiteneſs of the ground; the wax, in rubbing on the board, was unavoidably thicker in ſome parts than in others, and the Spaniſh white the ſame: on this I ſuſpected there muſt be ſome miſtake in the Spaniſh white, and made the inquiry mentioned (in the note A).

"To obviate the inequality of the ground in the firſt experiment;

"Exp. 2. A piece of old wainſcot (oak board) $\frac{1}{4}$th of an inch thick; which, having been part of an old drawer, was not likely to ſhrink on being brought near the fire: this was ſmoothed with a fiſh-ſkin, made quite warm before the fire; and then, with a bruſh dipped in white wax, melted in an earthen pipkin, ſmeared all over, and applied to the fire again, that the wax might be equally thick on all parts of the board, a ground was laid (on the waxed board), with levigated chalk mixed with gum-water, (*viz.* gum Arabic diſſolved in water): when it was dry, I painted it with a kind of landſcape; and purſuing the method laid down by count Caylus, brought it gradually to the fire. I fixed the picture on a fire-ſcreen, which would preſerve the heat, and communicate it to the back part of the board. This was placed firſt at the diſtance of three feet from the fire, and brought forwards by ſlow degrees, till it came

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(A) "Spaniſh chalk is called by Dr Parſons, in a note, *Spaniſh white* This is a better kind of whitening than the common, and was the only white that had the name of *Spaniſh* annexed to it that I could procure, though I inquired for it at moſt if not all the colour-ſhops in town.

"My friend M. da Coſta ſhowed me a piece of Spaniſh chalk in his collection, which ſeemed more like a CIMOLIA (tobacco-pipe clay), and was the reaſon of my uſing that in one of the experiments.

within one foot of the fire, which made the wax ſwell and bloat up the picture; but as the chalk did not abſorb the wax, the picture fell from the board and left it quite bare.

“ Exp. 3. I mixed three parts white wax, and one part white reſin, hoping the tenacity of the reſin might preſerve the picture. This was laid on a board heated with a bruſh, as in the former; and the ground was chalk, prepared as before. This was placed horizontally on an iron box, charged with an hot heater, ſhifting it from time to time, that the wax and reſin might penetrate the chalk; and hoping from this poſition, that the ground, bloated by melting the wax, would ſubſide into its proper place; but this, like the other, came from the board, and would not at all adhere.

“ Exp. 4. Prepared chalk four drams, white wax, white reſin, of each a dram, burnt alabaſter half a dram, were all powdered together and ſifted, mixed with ſpirit of molaſſes inſtead of water, and put for a ground on a board ſmeared with wax and reſin, as in Exp. 3. This was alſo placed horizontally on a box-iron as the former: the picture bliſtered, and was cracked all over: and though removed from the box-iron to an oven moderately heated (in the ſame horizontal poſition), it would not ſubſide, nor become ſmooth When it was cold, I took an iron ſpatula made warm, and moved it gently over the ſurface of the picture, as if I were to ſpread a plaſter. (This thought occurred. from the board being prepared with wax and reſin, and the ground having the ſame materials in its compoſition, the force of the ſpatula might make them unite). This ſucceeded ſo well, as to reduce the ſurface to a tolerable degree of ſmoothneſs; but as the ground was broke off in many places, I repaired it with flake white, mixed up with the yolk of an egg and milk, and repainted it with molaſſes ſpirit (inſtead of water), and then put it into an oven with a moderate degree of heat. In this I found the colours fixed, but darker than when it was at firſt painted: and it would bear being waſhed with water, not rubbed with a wet cloth.

“ Exp. 5. A board (that had been uſed in a former experiment) was ſmeared with wax and reſin, of each equal parts; was wetted with molaſſes ſpirit, to make whitening (or Spaniſh white) mixed with gum-water adhere. This, when dry, was ſcraped with a knife, to make it equally thick in all places. It was put into a warm oven, to make the varniſh incorporate partly with the whitening before it was painted; and it had only a ſmall degree of heat: water only was uſed to mix the colours. This was again put into an oven with a greater degree of heat; but it flaked off from the board: whether it might be owing to the board's having had a ſecond coat of varniſh (the firſt having been ſcraped and melted off), and that the unctuous parts of the wax had ſo entered its pores, that it would not retain a ſecond varniſh, I cannot tell.

“ Exp. 6. Having miſcarried in theſe trials, I took a new board, planed ſmooth, but not poliſhed either with a fiſh-ſkin or ruſhes: I warmed it, and ſmeared it with wax only; then took *cimolia* (tobacco-pipe clay) diveſted of its ſand, by being diſſolved in water and poured off, leaving the coarſe heavy parts behind. After this was dried and powdered, I mixed it with a ſmall quantity of the yolk of an egg and cow's milk, and made a ground with this on the waxed board: this I was induced to try, by knowing that the yolk of an egg will diſſolve almoſt all unctuous ſubſtances, and make them incorporate with water; and I apprehended, that a ground, thus prepared, would adhere ſo much the more firmly to the board than the former had done, as to prevent its flaking off. The milk, I thought, might anſwer two purpoſes; firſt, by uniting the ground with the wax; and ſecondly, by anſwering the end of ſize or gum-water, and prevent the colours from ſinking too deep into the ground, or running one into another. When the ground was near dry, I ſmoothed it with a pallet knife, and waſhed with milk and egg where I had occaſion to make it ſmooth and even: when dry I painted it, mixing the colours with common water; this, on being placed horizontally in an oven only warm enough to melt the wax, flaked from the board; but held ſo much better together than any of the former, that I paſted part of it on paper.

“ Exp. 7. Flake-white (or the pureſt ſort of white-lead) mixed with egg and milk, crumbled to pieces in the oven, put on the waxed board, as in the laſt experiment.

“ The bad ſucceſs which had attended all the former experiments, led me to conſider of what uſe the wax was in this kind of painting: and it occurred to me, that it was only as a varniſh to preſerve the colours from fading.

“ In order to try this:

“ Exp. 8. I took what the brick-layers call *fine ſtuff*, or *putty* (B): to this I added a ſmall quantity of burnt alabaſter, to make it dry: this it ſoon did in the open air; but before I put on any colours, I dried it gently by the fire, leſt the colours ſhould run. When it was painted, I warmed it gradually by the fire (to prevent the ground from cracking) till it was very hot. I then took white wax three parts, white reſin one part, melted them in an earthen pipkin, and with a bruſh ſpread them all over the painted board, and kept it cloſe to the fire in a perpendicular ſituation, that what wax and reſin the plaſter would not abſorb might drop off. When it was cold, I found the colours were not altered, either from the heat of the fire, or paſſing the bruſh over them. I then rubbed it with a ſoft linen cloth, and thereby procured a kind of gloſs, which I afterwards increaſed by rubbing it with an hard bruſh; which was ſo far from ſcratching or leaving any marks on the picture, that it became more ſmooth and poliſhed by it.

“ After I had made all the foregoing experiments, in converſation with my honoured and learned friend Dr Kidby, a fellow of this ſociety, I ſaid I had been trying to find out what the encauſtic painting of the ancients was Upon which he told me, that there was a paſſage in Vitruvius *de Architectura*, relative to that kind of painting; and was ſo good as to tranſcribe it for me from the 7th book, chap. 9. *De minii temperatura.* Vitruvius's words are: *At ſi quis ſubtilior fuerit, & voluerit expolitionem miniaceam ſuum colorem retinere,*

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(B) Putty is lime ſlaked, and, while warm, diſſolved in water, and ſtrained through a ſieve.

*retinere, cum paries expolitus & aridus fuerit, tunc ceram Punicam liqueſactam igni, paulo oleo temperatam, ſeta inducat, deinde poſtea carbonibus in ferreo vaſe compoſitis, eam ceram apprime cum pariete, caleſaciendo ſudore cogat, fiatque ut peræquetur, deinde cum candela linteiſque puris ſubigat, uti ſigna marmorea nuda curantur. Hæc autem* καυσις *Græce dicitur. Ita obſtans ceræ Punicæ lorica non patitur, nec lunæ ſplendorem, nec ſolis radios lambendo eripere ex his politionibus colorem.*

" Which I thus tranſlate : ' But if any one is more wary, and would have the poliſhing [painting] with vermilion hold its colour, when the wall is painted and dry, let him take Carthaginian [Barbary] wax, melted with a little oil, and rub it on the wall with an hair-pencil; and afterwards let him put live coals into an iron veſſel [chaffing-diſh], and hold it cloſe to the wax, when the wall, by being heated, begins to ſweat; then let it be made ſmooth : afterwards let him rub it with a (c) candle and (d) clean linen rags, in the ſame manner as they do the naked marble ſtatues. This the Greeks call καυσις. The coat of Carthaginian wax (thus put on) is ſo ſtrong, that it neither ſuffers the moon by night, nor the ſun-beams by day, to deſtroy the colour.'

" Being ſatisfied, from this paſſage in Vitruvius, that the manner of uſing wax in Exp. 8. was right, I was now to find if the wax-varniſh, thus burnt into the picture, would bear waſhing. But here I was a little diſappointed ; for rubbing one corner with a wet linen cloth, ſome of the colour came off; but waſhing it with a ſoft hair-pencil dipped in water, and letting it dry without wiping, the colour ſtood very well.

" A board painted, as in Exp. 8. was hung in the moſt ſmoky part of a chimney for a day, and expoſed to the open air in a very foggy night. In the morning the board was ſeemingly wet through, and the water ran off the picture. This was ſuffered to dry without wiping ; and the picture had not ſuffered at all from the ſmoke or the dew, either in the ground or the colours; but when dry, by rubbing it, firſt with a ſoft cloth, and afterwards with a bruſh, it recovered its former gloſs.

" Suſpecting that ſome tallow might have been mixed with the white wax I had uſed, which might cauſe the colours to come off on being rubbed with a wet cloth, I took yellow wax which had been melted from the honeycomb in a private family, and conſequently not at all adulterated: to three parts of this I added one part reſin, and melted them together.

" Exp. 9. Spaniſh-white, mixed with fiſh-glue, was put for a ground on a board, and painted with water-colours only. The board was made warm ; and then the wax and reſin were put on with a bruſh, and kept cloſe to the fire till the picture had imbibed all the varniſh, and looked dry. When it was cold, I rubbed it firſt with a linen cloth, and then poliſhed it with an hard bruſh.

" In theſe experiments I found great difficulties with regard to colours. Many water-colours being made from the juices of plants, have ſome degree of an acid in them ; and theſe, when painted on an alkaline ground, as chalk, whitening, *cimolia*, and plaſter, are totally changed in their colours, and from green become brown ; which contributes much to make the experiments tedious. I would therefore adviſe the uſe of mineral or metallic colours for this ſort of painting, as moſt likely to preſerve their colour: for although I neutralized Spaniſh white, by fermenting it with vinegar, and afterwards waſhed it very well with water, it did not ſucceed to my wiſh.

" Theſe experiments, and this paſſage from Vitruvius, will in ſome meaſure explain the obſcurity of part of that paſſage in Pliny which Dr Parſons, in his learned comment on the encauſtic painting with wax, ſeems to deſpair of.

" *Ceris pingere*, was one ſpecies of encauſtic painting. Ενκαυστον, *inuſtum*, may be tranſlated, " forced in by the means of fire, burnt in:" for whatever is forced in by the help of fire can be rendered into Latin by no other ſignificant word that I know of but *inuſtum*. If this is allowed me, and I think I have the authority of Vitruvius (a writer in the Auguſtine age) for it, who ſeems to have wrote from his own knowledge, and not like Pliny, who copied from others much more than he knew himſelf, the difficulty with regard to this kind of painting is ſolved, and the encauſtic with burnt wax recovered to the public.

" What he means by the next kind he mentions, *in ebore ceſtro id eſt viriculo*, I will not attempt to explain at preſent.

" The ſhip-painting is more eaſily accounted for: the practice being in part continued to this time ; and is what is corruptly called *breaming*, for brenning or burning.

" This is done by reeds ſet on fire, and held under the ſide of a ſhip till it is quite hot; then reſin, tallow, tar, and brimſtone, melted together, and put on with an hair bruſh while the planks remain hot, make ſuch a kind of paint as Pliny deſcribes : which, he ſays, *nec ſole, nec ſale, ventiſque corrumpitur*. As they were ignorant of the uſe of oil-painting, they mixed that colour with the wax, &c. which they intended for each particular part of the ſhip, and put it on in the manner above deſcribed.

" In the pictures painted for theſe experiments, and now laid before your lordſhip and the ſociety, I hope neither the deſign of the landſcape, nor the execution of it, will be ſo much taken into conſideration as the varniſh (which was the thing wanted in this inquiry): and I think that will evince, that the encauſtic painting

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(c) The account of the method of poliſhing [painting] walls coloured with vermilion, gave me great ſatisfaction, as it proved the method I had taken in experiment 8. (which I had tried before I ſaw or knew of this paſſage in Vitruvius) was right. The uſe of the candle, as I apprehend, was to melt the wax on the walls where by accident the bruſh had put on too much, or afford wax where the bruſh had not put on enough, or had left any part bare.

(d) The rubbing the wall with a linen cloth, while warm, will do very well, where there is only one colour to be preſerved ; but where there are many, as in a landſcape, it will be apt to take off ſome, or render the colouring rather faint ; which I found by wiping the wax off from a painting while it was hot.

ing with burnt wax is fully reſtored by theſe experiments; and though not a new invention, yet having been loſt for ſo many ages, and now applied further, and to other purpoſes, than it was by Vitruvius (who confined it to vermilion only), may alſo amount to a new diſcovery, the uſe of which may be a means of preſerving many curious drawings to poſterity: for this kind of painting may be on paper, cloth, or any other ſubſtance that will admit a ground to be laid on it. The proceſs is very ſimple, and is not attended with the diſagreeable ſmell unavoidable in oil-painting, nor with ſome inconveniences inſeparable from that art; and as there is no ſubſtance we know more durable than wax, it hath the greateſt probability of being laſting."

Still, however, there ſeem to have been ſome defects or inconveniences attending theſe and other ſubſequent attempts: for we find the ancient or ſome ſimilar method of painting in wax remaining a deſideratum upwards of 25 years after the publication of the preceding experiments; when in 1787 a method was communicated to the Society of Arts by Miſs Greenland, for which ſhe was rewarded with a prize. The ground of her information ſhe received at Florence, through the acquaintance of an amateur of painting, who procured her the ſatiſfaction of ſeeing ſome paintings in the ancient Grecian ſtyle, executed by Signora Parenti, a profeſſor at that place, who had been inſtructed by a Jeſuit at Pavia, the perſon who made the fartheſt diſcoveries in that art. Miſs Greenland's friend knowing ſhe was fond of painting, informed her what were the materials the paintreſs uſed, but could not tell her the proportions of the compoſition; however, from her anxiety to ſucceed in ſuch an acquiſition, ſhe made various experiments, and at laſt obtained ſuch a ſufficient knowledge of the quantities of the different ingredients as to begin and finiſh a picture, which ſhe afterwards preſented to the Society for their inſpection.

Her method is as follows: "Take an ounce of white wax, and the ſame weight of gum maſtich powdered. Put the wax in a glazed earthen veſſel over a very ſlow fire; and when it is quite diſſolved ſtrew in the maſtich, a little at a time. ſtirring the wax continually until the whole quantity of gum is perfectly melted and incorporated: then throw the paſte into cold water; and when it is hard, take it out of the water, wipe it dry, and beat it in one of Mr Wedgwood's mortars, obſerving to pound it at firſt in a linen cloth to abſorb ſome drops of water that will remain in the paſte, and would prevent the poſſibility of reducing it to a powder, which muſt be ſo fine as to paſs through a thick gauze. It ſhould be pounded in a cold place and but a little while at a time, as after long beating the friction will in a degree ſoften the wax and gum, and inſtead of their becoming a powder they will return to a paſte.

"Make ſome ſtrong gum-arabic water; and when you paint, take a little of the powder, ſome colour, and mix them together with the gum-water Light colours require but a ſmall quantity of the powder, but more of it muſt be put in proportion to the body and darkneſs of the colours; and to black there ſhould be almoſt as much of the powder as colour.

"Having mixed the colours, and no more than can be uſed before they grow dry, paint with fair water, as is practiſed in painting with water-colours, a ground on the wood being firſt painted of ſome proper colour prepared in the ſame manner as is deſcribed for the picture; walnut-tree and oak are the ſorts of wood commonly made uſe of in Italy for this purpoſe. The painting ſhould be very highly finiſhed; otherwiſe, when varniſhed, the tints will not appear united.

"When the painting is quite dry, with rather a hard bruſh, paſſing it one way, varniſh it with white wax, which is put into an earthen veſſel, and kept melted over a very ſlow fire till the picture is varniſhed, taking great care the wax does not boil. Afterwards hold the picture before a fire, near enough to melt the wax, but not make it run; and when the varniſh is entirely cold and hard, rub it gently with a linen cloth. Should the varniſh bliſter, warm the picture again very ſlowly, and the bubbles will ſubſide. When the picture is dirty, it need only be waſhed with cold water."

The opinion given by the Society upon the above is: The method made uſe of by Miſs Greenland provides againſt all inconveniences; and the brilliancy of the colours in the picture painted by her, and exhibited to the Society, fully juſtifies the opinion, that the art of painting in wax, as above deſcribed, highly merited the reward of a gold pallet voted to her on this occaſion.

ENCEINTE, in fortification, is the wall or rampart which ſurrounds a place, ſometimes compoſed of baſtions or curtains, either faced or lined with brick or ſtone, or only made of earth. The enceinte is ſometimes only flanked by round or ſquare towers, which is called a *Roman wall*.

ENCEPHALI, in medicine, worms generated in the head, where they cauſe ſo great a pain as ſometimes to occaſion diſtraction

The encephali are very rare; but there are ſome diſeaſes wherein they ſwarm; from whence we are told peſtilential fevers have wholly ariſen. Upon the diſſection of one who died of this fever, a little, ſhort, red worm was found in the head, which malmſey wine, wherein horſe-radiſh had been boiled, could alone deſtroy. This medicine was afterwards tried on the ſick, moſt of whom it cured.

The like worms have alſo been taken out by trepanning, and the patient cured. Thoſe worms that generate in the noſe, ears, and teeth, are alſo called *encephali*.

ENCHANTER, a perſon ſuppoſed to practiſe enchantment or faſcination. See FASCINATION, WITCHCRAFT, &c.

*ENCHANTER's Nightſhade*, in botany. See CIRCÆA.

ENCHASING, INCHASING, or *Chaſing*, the art of enriching and beautifying gold, ſilver, and other metal-work, by ſome deſign or figures repreſented thereon in low relievo.

Enchaſing is practiſed only on hollow thin works, as watch-caſes, cane-heads, tweezer-caſes, or the like. It is performed by punching or driving out the metal, to form a figure, from withinſide, ſo as to ſtand out prominent from the plane or ſurface of the metal. In order to this, they provide a number of fine ſteel blocks or puncheons of divers ſizes; and the deſign being drawn on the ſurface of the metal, they apply the inſide upon the heads or tops of theſe blocks, directly under the lines or parts of the figures; then, with a fine hammer, ſtriking on the metal, ſuſtained by the block, the metal yields, and the block makes an indenture or cavity on the inſide, correſponding to which there is a prominence on the outſide, which is to ſtand for that part of the figure.

Thus the workman proceeds to chaſe and finiſh all the parts by the ſucceſſive application of the block and hammer to the ſeveral parts of the deſign. And it is wonderful to conſider with what beauty and juſtneſs, by this ſimple piece of mechaniſm the artiſts in this kind will repreſent foliages, groteſques, animals, hiſtories, &c.

ENCLITICA, in grammar, particles which are ſo cloſely united with other words as to ſeem part of them, as in *virumque*, &c.—There are three enclitic particles in Latin, viz. *que*, *ne*, *ve*.

ENCRATITES, in church-hiſtory, heretics who appeared towards the end of the ſecond century: they were called *Encratites*, or *Continentes*, becauſe they gloried in abſtaining from marriage and the uſe of wine and animal-food.

ENCURECK, in natural hiſtory, a venomous inſect found in Perſia, and ſaid to be a kind of tarantula. According to Olearius as quoted by Mr Boyle, it neither ſtings nor bites; but lets fall its venom like a drop of water, which cauſes inſufferable pain in the part for a time, and afterwards ſo profound a ſleep, that nothing can awake the patient except cruſhing one of the creatures on the part affected. It is nevertheleſs ſaid, that the ſheep eat theſe inſects without damage.

ENCYCLOPÆDIA, a term nearly ſynonymous with CYCLOPÆDIA; but adopted in preference to it in denominating the preſent work, as being more definite and of better authority. According to an obſervation of the late learned printer Mr Bower, the prepoſition EN makes the meaning of the word more preciſe: For *Cyclopædia* may denote "the inſtruction OF a circle," as *Cyropædia* is "the inſtruction OF Cyrus," whereas in *Encyclopædia* the prepoſition determines the word to be from the dative of *cyclus*, "inſtruction IN a circle." And Voſſius in his book *De vitiis ſermonis*, has obſerved, "That *Cyclopædia* is uſed by ſome authors, but *Encyclopædia* by the beſt."

ENDEMIC, or ENDEMICAL, DISEASES, thoſe to which the inhabitants of particular countries are ſubject more than others, on account of the air, water, ſituation, and manner of living.

ENDIVE, in botany. See CICHORIUM.

ENDLESS, ſomething without an end: thus authors mention endleſs rolls, the endleſs ſcrew, &c.

ENDOR, (anc. geog.), a town of Galilee, four miles to the ſouth of mount Tabor; in the tribe of Manaſſeh, where the Pythoneſs was conſulted by Saul: at this day, ſays Jerome, a large village.

ENDORSE, in heraldry, an ordinary, containing the eighth part of a pale, which Leigh ſays is only uſed when a pale is between two of them.

ENDORSED, in heraldry, is ſaid of things borne back to back, more uſually called ADOSSE.

ENDORSEMENT, in law and commerce. See INDORSEMENT.

ENDOWMENT, in law, denotes the ſettling a dower on a woman: though ſometimes it is uſed figuratively, for ſettling a proviſion upon a parſon, on the building of a church; or the ſevering a ſufficient portion of tithes for a vicar, when the benefice is appropriated.

ENDYMION, (fab. hiſt.), a ſhepherd, ſon of Æthlius and Calyce. It is ſaid that he required of Jupiter to grant to him to be always young, and to ſleep as much as he would; whence came the proverb of *Endymionis ſomnum dormire*, to expreſs a long ſleep. Diana ſaw him naked as he ſlept on mount Latmos; and was ſo ſtruck with his beauty, that ſhe came down from heaven every night to enjoy his company. Endymion married Chromia daughter of Itonus; by whom he had three ſons Pæon, Epeus, and Æolus, and a daughter called *Eurydice*. The fable of Endymion's amours with Diana, or the moon, aroſe from his knowledge of aſtronomy; and as he paſſed the night on ſome high mountain to obſerve the heavenly bodies, it came to be reported that he was courted by the moon. Some ſuppoſe that there were two of that name; the ſon of a king of Elis, and the ſhepherd or aſtronomer of Caria. The people of Heraclea maintained that Endymion died on mount Latmos, and the Eleans pretended to ſhow his tomb at Olympia in Peloponneſus.

ENEMY, in law, an alien or foreigner, who publicly invades the kingdom.

ENERGUMENS, in church-hiſtory, perſons ſuppoſed to be poſſeſſed by the devil, concerning whom there were many regulations among the primitive Chriſtians. They were denied baptiſm and the euchariſt; at leaſt, this was the practice of ſome churches: and though they were under the care of exorciſts, yet it was thought a becoming act of charity, to let them have the public prayers of the church, at which they were permitted to be preſent. See EXORCISM.

ENERGY, a term of Greek origin, ſignifying the power, virtue, or efficacy of a thing. It is alſo uſed, figuratively, to denote emphaſis of ſpeech.

ENERVATING, the act of deſtroying the force, uſe, or office, of the nerves, either by cutting them, by weakening them with debauchery, or by ſome other violence.

Exceſs of wine, and other ſtrong, hot, ſpirituous liquors, enervate or weaken the nerves. When they would render a horſe uſeleſs, they enervate him, or cut his nerves.

ENFANS PERDUS, the ſame with forlorn-hope. See FORLORN.

ENFILADE, in the art of war, is uſed in ſpeaking of trenches, or other places, which may be ſcoured by the enemy's ſhot along their whole length. In conducting the approaches at a ſiege, care muſt be taken that the trenches be not enfiladed from any work of the place.

ENFINE', formerly ANTINOE; a city of Egypt, built by Adrian in honour of his favourite Antinous. It is ſituated towards the middle of the Said, or Upper Egypt, and ſtill contains ſeveral ſtately monuments of antiquity. In ancient times this city was very magnificent. It was about half a league in circumference, having two principal ſtreets 45 feet wide, interſecting each other at right angles, and running thro' its whole length. The others were more narrow, but equally ſtraight; the two largeſt having gates at each end, part of which ſtill remain. According to the Nubian geographer, it was called the city of the Magi, becauſe Pharaoh is ſaid to have cauſed the magicians come from thence to his court. Near it were the ruins of Abydus, where there was an oracle of the god Beſa, one of the moſt ancient in Egypt, and which was ſtill famous in the time of Conſtantius; and hence ſome have derived the appellation juſt mentioned, the neighbouring people coming in crowds to conſult the oracle.

The ruins of the gates are the moſt beautiful pieces of architecture to be met with in this place. The handſomeſt has three vaulted entries; the middle one being 40 feet in height, 22 wide, and 20 thick; the other two ſmaller. Each of the facades of this edifice is ornamented with four pilaſters in bas relief, with Corinthian capitals, the acanthus leaves of which have a conſiderable projection. It was ſurrounded by eight Corinthian columns, of which only one now remains, but the pedeſtals of the reſt are ſtill entire. Beſides theſe, there are heaps of rubbiſh in different parts of the town, apparently the remains of ancient temples or palaces. All theſe ſeem to have been bordered by a colonnade, forming a portico on each ſide, where the inhabitants might walk ſecure from the heat of the ſun. One of the ſquares was ornamented with four large Corinthian pillars, three of which are deſtroyed all but the baſes. The fourth is quite entire, about 50 feet high, and the ſhaft compoſed of ſeveral ſtones. The pedeſtal has a Greek inſcription, pretty much defaced, dedicating it to the emperor Alexander Severus, to whom the ſenate of ALEXANDRIA had already dedicated the famous column mentioned under that article. Theſe four other columns were therefore probably raiſed in honour of that emperor after his victories over the Perſians; for the foliage of the oak, with which the firſt ſtone of the ſhaft is decorated, was a ſign of victory among the Romans. Towards the end of the fourth century the city was peopled by Chriſtians; and Palladius aſſures us, that there were at that place 12 convents of virgins, and ſeveral others inhabited by monks. In the environs there are ſtill ſeveral coptic monaſteries poſſeſſed by monks equally miſerable and ignorant. The Nubian Geographer informs us, that the city was ſurrounded by a well cultivated country, abounding in fruits and harveſts; but theſe have now given place to ſands and barren deſarts. The ruins of Abydus above mentioned are ſtill to be ſeen near this place.

ENFRANCHISEMENT, in law, the incorporating a perſon into any ſociety or body politic.

ENGASTRIMYTHI, in Pagan theology, the Pythians, or prieſteſſes of Apollo, who delivered oracles from within, without any action of the mouth or lips.

The ancient philoſophers, &c. are divided upon the ſubject of the engaſtrimythi. Hippocrates mentions it as a diſeaſe. Others will have it a kind of divination. Others attribute it to the operation or poſſeſſion of an evil ſpirit. And others to art and mechaniſm. M. Scottus maintains that the engaſtrimythi of the ancients were poets, who, when the prieſts could not ſpeak, ſupplied the defect by explaining in verſe what Apollo dictated in the cavity of the baſon on the ſacred tripod.

ENGENDERING, a term ſometimes uſed for the act of producing or forming any thing: thus meteors are ſaid to be engendered in the middle region of the atmoſphere, and worms in the belly.

ENGINE, in mechanics, is a compound machine, made of one or more mechanical powers, as levers, pullies, ſcrews, &c. in order to raiſe, caſt, or ſuſtain any weight, or produce any effect which could not be eaſily effected otherwiſe. The word is formed of the French *engin*, from the Latin *ingenium* "wit;" by reaſon of the ingenuity required in the contrivance of engines to augment the effect of moving powers.

*ENGINE for extinguiſhing Fires.* See HYDROSTATICS, n° 33.

*Pile ENGINE*, one contrived for driving piles. See *PILE-Engine.*

*Steam-ENGINE*, a machine to raiſe water by fire, or rather by the force of water turned into ſteam. See *STEAM-Engine.*

ENGINEER, in the military art, an able expert man, who, by a perfect knowledge in mathematics, delineates upon paper, or marks upon the ground, all ſorts of forts, and other works proper for offence and defence. He ſhould underſtand the art of fortification, ſo as to be able, not only to diſcover the defects of a place, but to find a remedy proper for them; as alſo how to make an attack upon, as well as to defend, the place. Engineers are extremely neceſſary for theſe purpoſes: wherefore it is requiſite, that beſides being ingenious, they ſhould be brave in proportion. When at a ſiege the engineers have narrowly ſurveyed the place, they are to make their report to the general, by acquainting him which part they judge the weakeſt, and where approaches may be made with moſt ſucceſs. Their buſineſs is alſo to delineate the lines of circumvallation and contravallation, taking all the advantages of the ground; to mark out the trenches, places of arms, batteries, and lodgments, taking care that none of their works be flanked or diſcovered from the place. After making a faithful report to the general of what is a-doing, the engineers are to demand a ſufficient number of workmen and utenſils, and whatever elſe is neceſſary.

ENGLAND, the ſouthern diviſion of the iſland of Great Britain. Including Wales, it is of a triangular form, and lies between the 50th and 55th degrees of north latitude, extending about 400 miles in length from ſouth to north, and in ſome places it is 300 miles in breadth. It is bounded by Scotland on the north; by the Engliſh Channel on the ſouth, dividing it from France; by the German Sea on the eaſt; and on the weſt by St George's, or the Iriſh, Channel.

At what time the iſland of Britain was peopled is uncertain; nor do we know whether the ſouthern or northern parts were firſt inhabited. We have no accounts that can be depended upon before the arrival of Julius Ceſar, and it is certain he found the ſouthern parts full of people of a very warlike diſpoſition. Theſe people, according to Cæſar, were a colony of the Gauls; and this opinion is embraced by moſt of the ancient as well as modern writers. It is chiefly founded on the agreement obſerved by the Romans between the two nations in their cuſtoms, manners, language, religion, government, way of fighting, &c. The more northern inhabitants, according to Tacitus,

Plate CLXXI.


England.
Deg. West from London
East Lon
Minutes of Time
XXXII West from London
XVI
VIII
0
VIII
British Statute Miles
5 15 30 45 65 85
SCOTLAND
IRELAND
IRISH SEA
ST. GEORGES CHANNEL
BRISTOL CHANNEL
ENGLISH CHANNEL
STRAITS of DOVER
BRITISH OCEAN
FRANCE
UNITED PROVINCES
FLANDERS
Edinburgh
Berwick
Holy I.
Staples
Alnwick
Coquet R.
Coquet I.
Morpeth
NORTHUMBERLAND
Newcastle
Tinmouth C.
Shields
Sunderland
Durham
DURHAM
Stockton
Whitby
Scarboro
Flamboro Hd.
Bridlington
Hull
Hedon
Spurn Hd.
Humber R.
YORK SHIRE
York
Wainfleet
Lincoln
LINCOLN SHIRE
Boston
Cromer
Norwich
NORFOLK
Thetford
Yarmouth
Easton Ness
Southwold
Orford
SUFFOLK
Ipswich
Harwich
ESSEX
LONDON
Thames R.
N. Foreland
Deal
S. Foreland
KENT
Canterbury
Dover
Hythe
Romney
Dungeness
Beachy Hd.
Seaford
SUSSEX
Chichester
Lewes
Shoreham
HAMP SH
Winchester
Southampton
I. of Wight
DORSET SH
Dorchester
DEVON SH.
Exeter
Tiverton
Tavistock
Plymouth
Dartmouth
Torbay
Start Pt.
CORNWALL
Penzance
Lands End
Mounts Bay
Lizard Pt.
Scilly Is.
Padstow
Barnstable
Hartland Pt.
Biddiford
Lundy I.
SOMERSET SH
Bath
Wells
Bristol
WILT SHIRE
Salisbury
Devizes
BERK SH
Reading
SURRY
Guilford
GLOCESTER
Glocester
Oxford
WARWICK
Coventry
Birmingham
NORTHAMPTON
Northampton
BEDFORD
HERTFORD
HUNTINGDON
CAMBRIDGE
Cambridge
RUTLAND
LEICESTER
NOTTINGHAM
DERBY SH
Derby
STAFFORD
Stafford
Litchfield
SHROP SH.
Shrewsbury
WORCESTER
Worcester
HEREFORD
Hereford
MONM
Monmouth
GLAMORGAN
Landaff
BRECKNOCK
RADNOR SH
Radnor
CARMARTHEN
Carmarthen
PEMBROKE
Pembroke
Milford Haven
St. Davids
CARDIGAN SH.
Cardigan
Cardigan B.
Aberistwith
MONTGOMERY
Montgomery
MERIONETH SH.
Harleigh
CARNARVON SH.
Carnarvon
Bangor
Beaumaris
Anglesey I.
Holy Head
DENBIGH
FLINT
Chester
CHESHIRE
Liverpool
Warrington
Manchester
Wigan
LANCASHIRE
Lancaster
Preston
Sheffield
Doncaster
Halifax
Leeds
Pontefract
Wetherby
Ripon
Richmond
N. Allerton
Thirsk
Pickering
New Malton
Kendal
Burton
WESTMORELAND
Appleby
Penrith
CUMBERLAND SHIRE
Carlisle
Cockermouth
Whitehaven
Ravenglass
I. of Man
Castleton
Ramsey
Dumfries
Wigton
Glenluce
Port Patrick
Mull of Galloway
Ayr
Arran I.
Ila I.
Fair Head
Coleraine
Londonderry
Carickfergus
Belfast
Down
Strangford
Carlingford
Dundalk
Drogheda
Dublin
Wicklow
Leighlin
Wexford
Waterford
Alderney
Guernsey
Sark
Jersey
C. de la Hogue
C. Barfleur
Harfleur
Havre de Grace
Rouen
Diepe
Abbeville
Boulogne
Calais
Dunkirk
Ostend
Middleburg
Helvoetsluys

England.

tus, came from Germany. This he infers from the make of their limbs; but Cæſar ſimply calls them *Aborigenes*.

England, including the principality of Wales, when firſt invaded by the Romans, was divided into 17 petty ſtates. 1. The Danmonii, called alſo *Dunmonii* and *Donmonii*, inhabiting the counties of Cornwal and Devonſhire. 2. The Durotriges, who inhabited the track now called *Dorſetſhire*. 3. The Belgæ poſſeſſed Somerſetſhire, Wiltſhire, and Hampſhire. 4. The Attrebatii, or inhabitants of Berkſhire. 5. The Regni, whoſe country bordered on that of the Attrebatii, and comprehended Surrey, Suſſex, and part of the ſea-coaſt of Hampſhire. 6. The Cantii, inhabiting the county now called *Kent*. 7. The Dobuni are placed by Ptolemy on the north ſide of the Thames, near its head, in the counties of Glouceſterſhire and Oxfordſhire. 8. The Catticuchlani, *Calyeuchlani*, *Cattidudani*, or *Cathicludani*, inhabited Buckinghamſhire, Bedfordſhire, and Hertfordſhire. 9. The Trinobantes, who poſſeſſed the counties of Eſſex and Middleſex. 10. The Iceni, whoſe country comprehended Suffolk, Norfolk, Cambridge, and Huntingdonſhire. Theſe are by Ptolemy called *Simeni*, and by others *Tigeni*. Cambden is of opinion, that they were the ſame whom Cæſar calls *Cenomagni*. 11. The Coritani, whoſe country comprehended Northamptonſhire, Lieceſterſhire, Rutlandſhire, Lincolnſhire, Nottinghamſhire, and Derbyſhire. 12. The Cornavii poſſeſſed Warwickſhire, Worceſterſhire, Staffordſhire, Shropſhire, and Cheſhire. 13. The Silures inhabited the counties of Radnorſhire, Brecknockſhire, Glamorganſhire, with Herefordſhire and Monmouthſhire. 14. The Demetæ inhabited part of Carmardinſhire, Pembrokeſhire, and Cardiganſhire. 15. The country of the Ordovices comprehended Montgomeryſhire, Merionethſhire, Caernarvonſhire, Denbighſhire, and Flintſhire. 16. The Brigantes poſſeſſed the countries of Yorkſhire, the biſhopric of Durham, Lancaſhire, Weſtmoreland, and Cumberland. 17. The county of Northumberland was held by the Ottadini, Ottadeni, or Ottalini. Their country, according to ſome, reached from the Tine to the river Forth; though the moſt common opinion is, that it reached only to the Tweed.

The above-mentioned names of theſe nations are plainly Roman, but the etymology of them is not eaſily aſcertained. Some attempt to derive them from words in the Old Britiſh language; but as this ſubject at beſt muſt be very obſcure and uncertain, we ſhall not enter into it.

Before the time of Julius Cæſar, the Romans had ſcarcely any knowledge of Britain; but that conqueror having ſubdued moſt of the Gallic nations on the oppoſite ſide of the channel, began to think of extending his conqueſts by the reduction of Britain. The motive for this expedition, aſcribed to him by Suetonius, was a deſire of enriching himſelf by the Britiſh pearls, which were then very much eſteemed. The pretence, however, which he made uſe of in order to juſtify his invaſion was, that the Britons had ſent aſſiſtance to the Gauls during his wars with them.

Cæſar undertook his firſt expedition againſt Britain when the ſummer was already far ſpent, and therefore he did not expect to finiſh the conqueſt of the country that campaign. He thought, however, that it would be a conſiderable advantage to view the iſland, and learn ſomething of the manners and cuſtoms of the natives; after which he could more eaſily take ſuch meaſures as would enſure a permanent conqueſt on his return. Having marched all his forces into the country of the Morini, now the province of Picardy, from whence was the ſhorteſt paſſage into Britain; he ordered at the ſame time all the veſſels that lay in the neighbouring ports, and a fleet which he had built the year before for an expedition againſt the Morini, to attend him. The Britons, alarmed at his preparations, ſent ambaſſadors with offers of ſubmiſſion; but Cæſar, though he received them with great kindneſs, did not abandon his intended ſcheme of an invaſion. He waited till the arrival of C. Voluſenus, whom he had ſent out with a ſingle galley to make diſcoveries on the coaſt. Voluſenus did not think proper to land; but, having made what obſervations he could, returned after five days abſence. and Cæſar immediately ſet ſail for Britain. His force conſiſted of two legions embarked on board 80 tranſports; and he appointed 18 more which lay wind-bound about eight miles off, to convey over the cavalry; but theſe laſt orders were too ſlowly executed, which occaſioned ſome difficulty in his landing.

4
Manners, cuſtoms, &c. of the Britons.

The Britons at this time, according to Cæſar and other Roman hiſtorians, were very numerous, and had their country well ſtocked with cattle. Their houſes reſembled thoſe of the Gauls; and they uſed copper or iron plates weighed by a certain ſtandard inſtead of money. Their towns were a confuſed parcel of huts placed at a ſmall diſtance from one another, generally in the middle of a wood, to which all the avenues were ſlightly guarded with ramparts of earth, or with trees. All the nations were in a ſtate of the moſt wretched barbariſm, even when compared with the barbarous Gauls on the continent. The uſe of clothes was ſcarce known in the iſland. Only the inhabitants of the ſouthern coaſt covered their nakedneſs with the ſkins of wild beaſts; and this rather to avoid giving offence to the ſtrangers who came to trade with them, than out of any principle of decency. It was a general cuſtom among the Britons to paint their bodies with the juice of woad; but whether this was deſigned as ornament, or for any other purpoſe, is not known. They ſhaved their beards, all except their upper lip, and wore long hair. They alſo had their wives in common, a cuſtom which made them deteſtable to all other nations.

The arms of the Britons were a ſword, a ſhort lance, and a ſhield. Breaſt-plates and helmets they looked upon rather to be incumbrances, and therefore made no uſe of them. They uſually fought in chariots, ſome of which were armed with ſcythes at the wheels; they were fierce and cruel, and exceedingly bloodthirſty. When driven to diſtreſs, they could ſubſiſt themſelves even on the bark and roots of trees; and Dio Caſſius tells us, that they had ready, on all occaſions, a certain kind of food, of which, if they took but the quantity of a bean, they were not troubled with hunger or thirſt for a conſiderable time after. The ſouthern nations, however, were ſomewhat more civilized; and the Cantii, or inhabitants of Kent, more ſo than any of the reſt.

All the Britiſh nations at this time were very brave

6 and

5
They oppoſe Cæſar's landing.

and reſolute, owing to the continual diſſenſions among themſelves. They proved therefore very formidable enemies to the Romans; but the ſame diſſenſions which had taught them the art of war, alſo prevented them from uniting in the defence of their country. As ſoon as they perceived Cæſar's fleet approaching, a number of cavalry and chariots were diſpatched to oppoſe his landing, while a conſiderable body of infantry haſtened after. What chiefly embarraſſed the Romans in their attempt to land, was the largeneſs of their ſhips, which required a conſiderable depth of water. The ſoldiers therefore were obliged to leap into the ſea while loaded with their armour; and at the ſame time to encounter the enemy, who were quite diſengaged, as they either ſtood on dry ground, or waded but a little way into the water. Cæſar perceiving this diſadvantage, ordered his galleys to advance, with their broad ſides towards the ſhore, in order to drive the Britons from the water-ſide with their ſlings and arrows. On this the Britons, ſurpriſed at the galleys, a ſort of ſhipping they had never before ſeen, began to give ground. The fight, however, continued for ſome time, greatly to the diſadvantage of the Romans; till at laſt Cæſar, obſerving the diſtreſs of his men, cauſed ſeveral boats to be manned, and ſent them to the aſſiſtance of thoſe who were moſt expoſed to the enemy's aſſault. The Romans then ſoon got the better of the undiſciplined barbarians, however brave, and made good their landing; but they were unable to purſue the enemy for want of cavalry, which had not yet arrived.

6
They are defeated and ſue for peace.

7
Their treachery.

The Britons were ſo diſheartened with this bad ſucceſs, that they immediately ſent ambaſſadors to ſue for peace; which was granted, on condition of their delivering a certain number of hoſtages for their fidelity. Part of theſe they brought immediately; and promiſed to return in a few days with the reſt, who, they ſaid, lived at ſome diſtance. But, in the mean time, the 18 tranſports which carried Cæſar's cavalry, being driven back by a violent ſtorm, and the fleet which lay in the road being greatly damaged by the ſame, the Britons thought proper to break their engagements. Having therefore privately aſſembled their forces, they fell unexpectedly on the ſeventh legion while at a diſtance from the reſt and buſied in foraging. Cæſar being appriſed of their danger, haſtened to their aſſiſtance with two cohorts, and at laſt repulſed the enemy.—This, however, proved only a temporary deliverance; for the Britons, thinking it would be poſſible for them to cut off all the Romans at once, diſpatched meſſengers to inform ſeveral of the neighbouring nations of the weakneſs of the enemy's forces, and the happy opportunity that offered itſelf of deſtroying all theſe invaders at one blow.—On this, they drew together a great body of horſe and foot, which boldly advanced to the Roman intrenchments. But Cæſar came out to meet them; and the undiſciplined Britons being by no means able to cope with the Romans were put to flight with great ſlaughter. Having burnt ſeveral towns and villages, the victors returned to their camp, where they were ſoon followed by new deputies from the Britons. Cæſar being in want of horſe, and afraid leſt another ſtorm ſhould deſtroy the remainder of his fleet, granted them peace, on condition of their ſending him double the number of hoſtages into Gaul which they had before promiſed. The ſame night he ſet ſail, and ſoon arrived ſafe in Gaul.

Cæſ
turn

The Britons no ſooner perceived the Romans gone, than, as before, they broke through their engagements. Of all the ſtates who had promiſed to ſend hoſtages, only two performed their promiſes; and this neglect ſo provoked Cæſar, that he determined to return the year following with a far greater force. Having, therefore, cauſed his old veſſels to be refitted, and a great many new ones to be built, he arrived off the coaſt of Britain with a fleet of 600 ſhips and 28 galleys. The Britons made no oppoſition to his landing; but Cæſar, getting intelligence that an army was aſſembled at no great diſtance, marched in queſt of them. He found them encamped on the banks of a river, ſuppoſed to be the *Stour*, about 12 miles diſtant from the place where he had landed. They attempted to oppoſe his paſſage; but being briſkly attacked by the Roman cavalry, they were obliged to retire into a wood, all the avenues of which were blocked up by trees cut down for that purpoſe. This fortification, however, proved inſufficient to protect them. The ſeventh legion having caſt themſelves into a teſtudo, and thrown up a mount againſt their works, drove them from their aſylum; but as the day was far ſpent, a purſuit was not thought adviſable.

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Next morning Cæſar, with the greateſt part of his army, which he divided into three bodies, marched out in queſt of the enemy. But when he was already come in ſight of their rear, he was overtaken by meſſengers, who informed him, that his fleet was greatly damaged by a violent ſtorm which had happened the preceding night. This put an end to the purſuit for that time; but Cæſar having employed all the carpenters he had with him, and ſent for others from Gaul, in order to repair the damage, reſolved to prevent misfortunes of this kind for the future. He therefore drew all his ſhips aſhore, and incloſed them within the fortifications of his camp. This arduous undertaking employed his whole army for 10 days; after which he again ſet out in queſt of the enemy.

The Briton had made the beſt uſe they could of the reſpite afforded them by the ſtorm. They were headed by Caſſibelaunus king of the Trinobantes. He had formerly made war upon his neighbours; and having rendered himſelf terrible to them, was looked upon to be the moſt proper perſon for leading them on againſt the common enemy; and as ſeveral ſtates had now joined their forces, the Britiſh army was very numerous. Their cavalry and chariots attacked the Roman army while on their march; but were repulſed with loſs, and driven into the woods. The Romans purſued them too eagerly, and thus loſt ſome of their own men; which encouraged the Britons to make another fierce attack; but in this alſo they were finally unſucceſsful, and obliged to retire, though their loſs ſeems not to have been great.

Next day the Britons ſuddenly attacked the Roman legions as they were foraging; but meeting with a vigorous reſiſtance, they ſoon betook themſelves to flight. The Romans purſued them ſo cloſely, that having neither time to rally nor get down from their chariots according to cuſtom, great numbers of them were cut in pieces: and this overthrow had ſuch an effect upon the

auxiliaries

auxiliaries of Caſſibelaunus, that all of them abandoned him; nor did the Britons ever afterwards engage Cæſar with united forces. Cæſar, purſuing his victory, marched towards the Thames, with a deſign to croſs that river, and enter the territories of the Trinobantes. The river was fordable only at one place, and that not without great difficulty; but when he came to it, he found the enemy's forces drawn up in a conſiderable body on the oppoſite bank, which was fortified with ſharp ſtakes. They had likewiſe driven many ſtakes of the ſame kind into the bottom of the river, the tops of which were covered with water. Theſe ſtakes are viſible to this day at a place called *Walton* in Surry. They are made of oak; and though they have been ſo long in the water, are as hard as Brazil, and as black as jet; and have ſometimes been pulled out in order to make knife-handles of them.

Cæſar was not at all diſmayed at theſe difficulties, which he had intelligence of by priſoners and deſerters. He ordered the cavalry to enter firſt, and the foot to follow. His orders were obeyed, and the ſoldiers advanced with ſuch reſolution, that though the infantry were up to the chin in water, the enemy, unable to ſuſtain their aſſault, abandoned the bank and fled. After this defeat, Caſſibelaunus himſelf deſpaired of ſucceſs, and therefore diſmiſſed all his forces except about 4000 chariots, with which he obſerved the motions of the Romans, haraſſing them by cutting off ſtraggling parties, &c. This, however, was not ſufficient to keep up the ſpirits of his countrymen. On the contrary, they depoſed him from the kingdom and choſe Mandubratius, whoſe father had been murdered by Caſſibelaunus, who thereupon uſurped the kingdom. The young prince had fled to Cæſar, who gave him protection; and the Trinobantes now offered to ſubmit to the conqueror, provided he would give them Mandubratius for their king.

Cæſar readily complied with the requeſt of the Trinobantes upon their ſending him 40 hoſtages: and the ſubmiſſion of the Trinobantes was ſoon followed by that of other ſtates and tribes; for each of the 17 nations already mentioned were compoſed of ſeveral different tribes, of which no particular account can be given.—Cæſar next marched to Verulamium, or Canterbury, which was Caſſibelaunus's capital, and which he ſtill kept poſſeſſion of; but tho' the place was ſtrongly fortified both by nature and art, the Britons were unable to bear the aſſault of the Romans, and therefore ſoon fled out at one of the avenues Many were taken as they attempted to make their eſcape, and many more cut in pieces.

After this loſs, Caſſibelaunus, as his laſt reſource, found means to draw into confederacy with him four kings of the Cantii. But though Cæſar gives them the title of kings, it is probable that they were only petty princes, tributary to the king of that nation. Their names were Cingetorix Corvilius, Taximagulus. and Segonax. Theſe, having raiſed what forces they could, attacked the camp where the ſhips were laid up: but the Romans having made a ſally, repulſed them with great ſlaughter, and then returned to their trenches without any loſs; after which, Caſſibelaunus thought proper to ſubmit to the conqueror. As the ſummer was already far ſpent, Cæſar hearkened to his propoſals. A peace was concluded on the following terms, viz. that the Britons ſhould pay an annual tribute to the Romans, that Caſſibelaunus ſhould leave Mandubratius in peaceable poſſeſſion of his dominions, that he ſhould not moleſt the Trinobantes, and that he ſhould deliver a certain number of hoſtages. Theſe terms being agreed to, Cæſar ſet ſail with his whole fleet from Britain, to which he never returned.

12
He leaves the iſland altogether.

Such is the account given by Cæſar himſelf of his two expeditions into Britain; but other authors have ſpoken very doubtfully of his victories in this iſland. Dio Caſſius tells us, that the Britons utterly defeated the Roman infantry, but were at laſt put in diſorder by their cavalry. Horace and Tibullus, in many parts of their works, ſpeak of the Britons as a people not yet conquered. Tacitus ſays, that Cæſar rather ſhowed the Romans the way to Britain, than put them in poſſeſſion of it; and Lucan tells us plainly, that Cæſar turned his back to the Britons and fled. This laſt, however, conſidering the conſummate military genius of Cæſar, is by no means probable. That he left Britain during the winter, was, in all probability, to prevent inſurrections among the Gauls, which might very readily have happened; and that he did not return to finiſh his conqueſt can be no wonder, ſeeing his ambition would certainly be more gratified by being called emperor of Rome, than conqueror of Britain.

The departure of Julius Cæſar, which happened about 53 years before Chriſt, left the Britons without any fear of a foreign enemy. We are not, therefore, to imagine, that they would regard their promiſes of paying tribute; nor was it probably demanded for a good number of years afterwards. Auguſtus, however, when he had got himſelf fully eſtabliſhed on the throne, had twice a deſign of invading Britain and forcing the inhabitants to pay the tribute promiſed to Julius Cæſar. Both times, however, he was prevented by revolts in different provinces in the empire, ſo that the Britons ſtill continued to enjoy their liberty. They thought proper, however, to court the favour of the Romans as much as they could by pretended ſubmiſſions; but, in the reign of Claudius, the Romans ſet about reducing them to ſubjection in good earneſt. The occaſion of this war is related by Dio Caſſius as follows. "Cunobelinus, the third in ſucceſſion from Caſſibelaunus, being dead, his two ſons, Togodumnus and Caractacus, ſucceeded to the throne; but whether they reigned jointly or ſeparately, is not known. In their reign one Bericus, of whom we alſo know very little, being driven out of the iſland for attempting to raiſe a ſedition, fled with ſome of his partiſans to Rome, and perſuaded Claudius to make war on his countrymen. The Britons, on the other hand, reſented the behaviour of Claudius in receiving theſe vagabonds, and therefore prohibited all intercourſe with the Romans. A much ſmaller offence than this would have been ſufficient at any time to provoke that haughty nation to declare war. An army was therefore immediately ordered into Britain, under the command of Plautius prætor in Gaul. The ſoldiers at firſt refuſed to embark, from a ſuperſtitious notion, that they were going to be ſent without the compaſs of the world; and this mutiny being related to the Britons, they did not make the neceſſary preparations for their own defence. The Roman ſoldiers were ſoon brought to a ſenſe of their duty; and ſet out from three different ports, in order

13
Why the war with the Romans was renewed.

to land in three different places of Britain at once. Being driven back by contrary winds, their fears began to return; but they reſumed their courage on the appearance of a meteor ſhooting from the eaſt, which they imagined was ſent from heaven to direct their courſe. They landed without oppoſition; and the Britons, not having drawn together a ſufficient army, kept in ſmall bodies behind their marſhes, and in woods, in order to ſpin out the war till winter; which they imagined Plautius would, like Cæſar, ſpend in Gaul.

14
The Britons defeated.

The Roman general marched firſt in queſt of the two kings Togodumnus and Caractacus; both of whom he found out, and defeated one after another. He then reduced part of the Dobuni, at that time ſubject to the Cattieuchlani; and leaving a garriſon to keep them in awe, he advanced to a river where the Britons lay careleſsly encamped, ſuppoſing that the Romans could not paſs it without a bridge. But the Germans in the Roman army had been accuſtomed to ſwim acroſs the ſtrongeſt currents in their heavy armour. They therefore paſſed the river firſt; and having, according to their orders, fallen only upon the enemy's horſes which drew their chariots, theſe formidable machines were rendered entirely uſeleſs; and the Britons were put to flight as ſoon as another part of the forces could paſs the river.

The Britons were not diſheartened with this defeat, but engaged the Romans next day with great bravery. Victory continued long doubtful; but at length the Romans prevailed, and the Britons were forced to betake themſelves to flight. This battle is thought to have been fought on the banks of the Severn. From thence the Britons fled to the mouth of the Thames. They were cloſely purſued by the Romans; but the latter being unacquainted with the flats and ſhallows of the river, were often in great danger. The Germans, however, croſſed by ſwimming as before, and the reſt on a bridge ſomewhat farther up the river; ſo that the Britons were in a ſhort time ſurrounded on all ſides, and great numbers of them cut in pieces. Many of the Romans, alſo, purſuing the fugitives with too great eagerneſs, were loſt in the marſhes.—In one of theſe battles Togodumnus was killed; but the Britons were ſo far from being diſheartened, that they ſhowed more eagerneſs than ever to oppoſe the Romans, in order to revenge his death. Plautius, therefore, did not think proper to penetrate farther into the country, but contented himſelf with putting garriſons in the places he had already conquered. He then wrote to the emperor himſelf; who no ſooner received an account of his ſucceſs, than he ſet out for Britain; where, having landed after a ſhort voyage, he joined Plautius on the banks of the Thames.

15
Claudius arrives in Britain.

Soon after the arrival of Claudius, the Romans paſſed the Thames, attacked the Britiſh army, and totally defeated it. The conſequence of this was the taking of Cunobelinus's capital, and the ſubmiſſion of ſeveral of the neighbouring ſtates. The emperor, however, did not make a long ſtay in the iſland, but left Plautius to purſue his conqueſts. This he did with ſuch ſucceſs, that, on his return to Rome, he was met without the gates by the emperor himſelf, who, at his ſolemn entry, gave him the right hand.—The Britons ſeem to have made a very obſtinate reſiſtance to the Roman arms about this time. Veſpaſian, who was afterwards emperor, is ſaid to have fought 30 battles with them; and the exploits of Titus his ſon are alſo much celebrated by the Roman hiſtorians.

In the ninth year of Claudius, P. Oſtorius Scapula was ſent into Britain. By far the greater part of the 17 nations formerly mentioned were at this time unconquered. Some of theſe had broken into the Roman territories; but Oſtorius falling unexpectedly upon them, put great numbers to the ſword, and diſperſed the reſt. To prevent them for the future from making inroads into the territories of the Romans or their allies, he built ſeveral forts on the Severn, the Avon, and the Nen, reducing the country ſouth of theſe rivers to a Roman province. This ſo highly offended the Iceni, that, being joined by the neighbouring nations, they raiſed a conſiderable army, and encamped in an advantageous ſituation, in order to prevent the Romans from penetrating farther into the iſland. Oſtorius, however, ſoon advanced againſt them. The Romans, as uſual, got the victory, and the enemy were purſued with great ſlaughter. The Roman general then, having quelled an inſurrection among the Brigantes, led his army againſt the Silures. They were headed by their king Caractacus, a moſt renowned warrior. He ſhowed his military talents by chooſing a very advantageous place for engaging the enemy. Tacitus tells us, "it was on the ridge of an exceeding ſteep mountain; and where the ſides of it were inclining and acceſſible, he reared walls of ſtone for a rampart. At the foot of the mountain flowed a river dangerous to be forded, and an army of men guarded his entrenchments." This hill is thought to be one called *Caer-Caradoc* in Shropſhire, ſituated near the conflux of the rivers Colun and Teme, and where the remains of ancient entrenchments are ſtill viſible.—On the approach of the enemy, Caractacus drew up his troops in order of battle, animating them with the following ſpeech, according to Tacitus. "That from this day, and this battle, they muſt date their liberty reſcued, or their ſlavery for ever eſtabliſhed. He then invoked the ſhades of thoſe heroes who had expelled Cæſar the dictator; thoſe brave men by whoſe valour they ſtill enjoyed freedom from Roman tribute and taxes, and by which their wives and children were as yet preſerved from proſtitution." The whole army then took a ſolemn oath either to conquer or die, and prepared for the charge with the moſt terrible ſhouts. Oſtorius was ſomewhat diſmayed when he conſidered the uncommon fierceneſs of the enemy, and the other difficulties which he had to encounter. He led on his men, however, to the charge; and the Romans were attended with their uſual good fortune. The Britons were put to flight. Vaſt numbers fell on the field of battle and in the purſuit, and many more were taken priſoners. Among the latter were the wife, the daughter, and the brothers, of Caractacus. The unfortunate prince himſelf fled to Cartiſmundua queen of the Brigantes, by whom he was delivered up to the Roman general, who ſent him in chains to Rome. Caractacus bore his misfortunes with magnanimity; and when he came before the emperor, addreſſed him in the following terms. "If my moderation in proſperity, O Claudius! had been as conſpicuous as my birth and fortune, I ſhould now have entered this city as a friend, and not as a priſoner; nor would you have diſdained

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the friendſhip of a prince deſcended from ſuch illuſtrious anceſtors, and governing ſo many nations. My preſent condition, I own, is to you honourable, to me humiliating. I was lately poſſeſſed of ſubjects, horſes, arms, and riches. Can you be ſurpriſed that I endeavoured to preſerve them? If you Romans have a deſire to arrive at univerſal monarchy, muſt all nations, to gratify you, tamely ſubmit to ſervitude? If I had ſubmitted without a ſtruggle, how much would it have diminiſhed the luſtre of my fall, and of your victory? And now, if you reſolve to put me to death, my ſtory will ſoon be buried in oblivion; but if you think proper to preſerve my life, I ſhall remain a laſting monument of your clemency."—This ſpeech had ſuch an effect upon Claudius, that he immediately pardoned Caractacus and his whole family, and commanded them to be ſet at liberty.

The Silures, notwithſtanding this terrible blow, continued the war with great vigour, and gained conſiderable advantages over the Romans; which ſo much affected Oſtorius, that he died of grief. He was ſucceeded by A. Didius, who reſtrained the incurſions of the Silures, but was not able to reſtore Cartiſmundua queen of the Brigantes, who had been depoſed by her ſubjects. Didius was ſucceeded by Veranius, and he by Suetonius Paulinus, who reduced the iſland of ANGLESEY, as related under that article. But while Paulinus was employed in the conqueſt of this iſland, he was alarmed by the news of an almoſt univerſal revolt among thoſe nations which had ſubmitted to the Romans. The Britons, tho' conquered, had ſtill a deſire of returning to their former ſtate of independence; and the Roman yoke became every day more unſupportable to them through the inſolence and oppreſſions of the Roman ſoldiers. The Britons had been long diſcontented, and were already in a very proper diſpoſition for a revolt, when an event happened which kindled theſe diſcontents into an open flame. Praſutagus, king of the Iceni, a prince renowned for opulence and grandeur, had, by his laſt will, left the Roman emperor joint-heir with his two daughters, in hopes of obtaining his favour and protection by ſo great an obligation. But the event turned out very different. No ſooner was he dead, than his houſes and poſſeſſions were all plundered by the Roman ſoldiers. The queen Boadicea remonſtrated againſt this injuſtice; but, inſtead of obtaining any redreſs, ſhe herſelf was publicly whipped, her daughters raviſhed, and all the relations of the late king reduced to ſlavery. The whole country alſo was plundered, and all the chiefs of the Iceni deprived of their poſſeſſions.

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Boadicea was a woman of too haughty a ſpirit tamely to bear ſuch indignities. She therefore perſuaded the Iceni to take up arms, which they very readily did. Then, being joined by the Trinobantes, and ſome other nations, they poured like a torrent on the Roman colonies. Every thing was deſtroyed with fire and ſword. The ninth legion, which had been left for the defence of the country under Petilius Cerealis, was defeated, the infantry totally cut in pieces, and the commander himſelf with the cavalry eſcaped with the utmoſt difficulty. Suetonius, alarmed at this news, immediately left Angleſey, and marched with the greateſt expedition to London. The inhabitants were overjoyed at his arrival, and uſed their utmoſt endeavours to detain him for their defence. But he refuſed to ſtay, and in a ſhort time left the place, notwithſtanding the intreaties of the inhabitants. The whole city lamented his departure; and they had reaſon. Suetonius was ſcarce gone, when Boadicea with her Britons entered, and put all they found in it to the ſword. None were taken priſoners, nor was any ſex or age ſpared, and many were tortured in the moſt cruel manner. Seventy thouſand perſons are ſaid to have periſhed on this occaſion at London and other Roman colonies.

19
They deſtroy 70,000 Romans.

20
They are utterly defeated.

The Britons, now elated with ſucceſs, aſſembled from all quarters in great numbers, ſo that Boadicea's army ſoon amounted to 230,000 men. They deſpiſed the Romans; and became ſo confident of victory, that they brought their wives and children along with them in waggons to be ſpectators of the deſtruction of their enemies. The event was what might naturally have been expected from ſuch ill-judged confidence. The Britons were overthrown with moſt terrible ſlaughter, no fewer than 80,000 being killed in the battle and purſuit; while the Romans had not above 400 killed, and not many more wounded. Boadicea, not able to ſurvive ſo great a calamity, put an end to her life by poiſon.

By this overthrow the Britons who had once been ſubdued were thoroughly prevented from raiſing any more inſurrections, and even thoſe who had not yet ſubmitted to the Roman yoke ſeemed to be intimidated from making incurſions into their dominions. Nothing remarkable therefore happened for ſome time. In the time of Veſpaſian, Petilius Cerealis being appointed governor of Britain, attacked the Brigantes, defeated them in ſeveral battles, and reduced great part of their country. He was ſucceeded by Julius Frontinus; who not only maintained the conqueſts of his predeceſſor, but reduced entirely the warlike nation of the Silures. Frontinus was ſucceeded by the celebrated Cneius Julius Agricola, who completed the conqueſt of all the ſouthern Britons.

21
Britain conquered by Agricola.

Juſt before the arrival of Agricola, the Ordovices had cut in pieces a band of horſe ſtationed on their confines, after which the whole nation had taken arms. The ſummer was pretty far ſpent, and the Roman army was quite ſeparated and diſperſed, the ſoldiers having aſſured themſelves of reſt for the remaining part of the year. Agricola, however, was no ſooner landed, than, having drawn together his legions, he marched againſt the enemy without delay. The Britons kept upon the ridges of the mountains; but Agricola led them in perſon up the aſcents. The Romans were victorious; and ſuch a terrible ſlaughter was made of the Britons that almoſt the whole nation of Ordovices was cut off. Without giving the enemy time to recover from the terror which this overthrow had occaſioned, Agricola reſolved upon the immediate reduction of Angleſey, which had been loſt by the revolt of Boadicea. Being deſtitute of ſhips, he detached a choſen body of auxiliaries who knew the fords, and were accuſtomed to manage their arms and horſes in the water. The Britons, who had expected a fleet and tranſports, were ſo terrified by the appearance of the Roman forces on their iſland, that they immediately ſubmitted, and Angleſy was once more reſtored to the Romans.

With the conqueſt of Angleſey ended the firſt cam-

England.

paign of Agricola; and he employed the winter in reconciling the Britons to the Roman yoke. In this he met with ſuch ſucceſs, through his wiſe and equitable conduct, that the Britons, barbarous as they were, began to prefer a life of ſecurity and peace, to that independency which they had formerly enjoyed, and which continually expoſed them to the tumults and calamities of war. The ſucceeding campaigns of Agricola were attended with equal ſucceſs; he not only ſubdued the 17 nations inhabiting England, but carried the Roman arms almoſt to the extremity of Scotland. He alſo cauſed his fleet to ſail round the iſland, and diſcovered the Orcades, or Orkney iſlands, which had before been unknown to the reſt of the world. His expedition took him up about ſix years, and was completed in the year of Chriſt 84.

Had this commander been continued in Britain, it is probable that both Scotland and England would have been permanently ſubdued; but he was recalled by Domitian in the year 85, and we are then almoſt totally in the dark about the Britiſh affairs till the reign of the emperor Adrian. During this interval the Caledonians had taken arms, and not only refuſed ſubjection to the Roman power themſelves, but ravaged the territories of the Britons who continued faithful to them. Adrian, for what reaſon is not well known, abandoned to them the whole track lying between the Tyne and the Forth. At the ſame time, in order to reſtrain them from making incurſions into the Roman territories, he built a wall 80 miles in length from the river Eden in Cumberland to the Tyne in Northumberland *. He was ſucceeded by Antoninus Pius, in whoſe reign the Brigantes revolted; and the Caledonians, having in ſeveral places broken down the wall built by Adrian, began anew to ravage the Roman territories. Againſt them the emperor ſent Lollius Urbicus, who reduced the Brigantes; and having defeated the northern nations, confined them within narrower bounds by a new wall †, extending probably between the friths of Forth and Clyde. From the time of Antoninus to that of Severus, the Roman dominions in Britain continued to be much infeſted by the inroads of the northern nations. That emperor divided Britain into two governments, the ſouthern and northern; but the governor of the northern diviſion was ſo haraſſed by continual incurſions of the Caledonians, that he was at length obliged to purchaſe a peace with money. The Caledonians kept the treaty for 15 years; after which, breaking into the Roman territories anew, they committed terrible ravages. Virius Lupus the governor, not being in a condition to withſtand them, acquainted the emperor with his diſtreſs intreating him to ſend powerful and ſpeedy ſupplies. Upon this Severus reſolved to put an end to the perpetual incurſions of the enemy by making a complete conqueſt of their country; for which purpoſe he ſet out for Britain, together with his two ſons Caracalla and Geta, at the head of a numerous army. The Caledonians no ſooner heard of his arrival, than they ſent ambaſſadors offering to conclude a peace upon honourable terms But theſe the emperor detained till he was ready to take the field, and then diſmiſſed them without granting their requeſt.

* See Adrian.

† See Antoninus's wall.

22
Expedition of Severus into Britain.

As ſoon as the ſeaſon was fit for action, Severus marched into the territories of the Caledonians, where he put all to fire and ſword. He advanced even to the moſt northerly parts of the iſland; and though no battle was fought in this expedition, yet through the continual ambuſcades of the enemy, and the inhoſpitable nature of the country, he is ſaid to have loſt 50,000 men. At laſt the Caledonians were obliged to ſue for peace; which was granted them on condition of their yielding part of their country, and delivering up their arms. After this the emperor returned to York, leaving his ſon Caracalla to command the army, and finiſh the new wall which had been begun between the friths of Forth and Clyde. But the emperor being taken ill at York, the Caledonians no ſooner heard of his indiſpoſition, than they again took up arms. This provoked Severus to ſuch a degree, that he commanded his ſon Caracalla to enter their country anew with the whole army, and to put all he met to the ſword without diſtinction of ſex or age. Before theſe orders, however, could be put in execution, his two ſons, having concluded a ſhameful peace with the Caledonians, returned to Rome.

A long chaſm now takes place in the hiſtory of the Roman dominions in Britain. In the beginning of Diocleſian's reign, Carauſius a native of Gaul, paſſing over into Britain, took upon him the title of *emperor*, and was acknowledged by all the troops quartered here. He was, however, killed in a battle with one of Conſtantius's officers, after he had enjoyed the ſovereignty for ſix or ſeven years. Conſtantine the Great began his reign in this iſland; and returned ſoon after he had left it, probably with a deſign to put a ſtop to the daily incurſions of the Caledonians. He altered the diviſion of that part of Britain ſubject to the Romans. Severus had divided it only into two provinces; but Conſtantine increaſed the number to three: *viz.* Britannia Prima, Britannia Secunda, and Maxima Cæſarienſis; and this laſt was afterwards divided into two, *viz.* Maxima Cæſarienſis and Flavia Cæſarienſis. The removal of the imperial ſeat from Rome to Conſtantinople, which happened in the reign of Conſtantine, gave the northern nations an opportunity of making frequent incurſions into the Roman provinces; the emperor having carried with him, firſt into Gaul, and then into the Eaſt, not only moſt of the Roman troops, but likewiſe the flower of the Britiſh youth.

About the latter end of the reign of Conſtantius ſon to Conſtantine the Great, the government of the province of Britain and other weſtern parts of the empire, was committed to Julian, afterwards called the *apoſtate*. While he was in his winter-quarters at Paris, he was informed that the Scots and Picts, about this time firſt diſtinguiſhed by theſe names, had broken into the Roman territories and committed every where dreadful ravages. Againſt them Julian diſpatched a body of troops under the command of Lupicinius. He embarked from Bologne in the depth of winter, but was no ſooner arrived at London than he was recalled; the enemy having probably found means to appeaſe Julian by their ſubmiſſions. Till the reign of Valentinian I. theſe nations ſtill continued to infeſt the Roman territories in Britain, and had now reduced the country to a moſt deplorable condition by their continual ravages. Valentinian ſent againſt them Theodoſius, father to the emperor of that name. That general

ral having divided his forces into ſeveral bodies, advanced againſt the enemy, who were roving up and down the country. The Scots and Picts were obliged to yield to the ſuperior valour and diſcipline of the Romans. Great numbers were cut in pieces; they were forced to abandon all the booty and priſoners they had taken, and to retire beyond the friths of Forth and Clyde. Theodoſius then entered London in triumph, and reſtored that city to its former ſplendor, which had ſuffered greatly by the former incurſions of the northern Britons. To reſtrain them from breaking anew into the provinces, Theodoſius built ſeveral forts or caſtles between the two friths; and having thus recovered all the country between Adrian's wall and the friths of Forth and Clyde, he formed of it a fifth province which he called *Valentia*.

Though Britain was now reduced to a ſtate of temporary tranquillity, yet as the Roman empire was daily declining, it is not to be ſuppoſed that ſufficient care could be taken to ſecure ſuch a diſtant province. In the reign of the emperor Honorious, the provincial Britons found themſelves annoyed not only by the Scots and Picts, but alſo by the depredations of the Saxons, who began to commit ravages on the ſea-coaſts. By the care, however, of Stilicho, prime miniſter to Honorius, matters were once more ſettled, and a particular officer was appointed to guard the coaſt againſt the attempts of the Saxons, with the title of *Comes limitis Saxonici*. But, not long after, the empire being over-run by barbarians, moſt of the Roman troops quartered in Britain were recalled, and the country left quite open to the attacks of the Scots and Picts.

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Upon this the provincials expecting no more aſſiſtance from Honorius, reſolved to ſet up an emperor of their own. Accordingly they inveſted with the imperial dignity one *Mark*, an officer of great credit among them. Him they murdered in a few days, and placed on the throne one Gratian a native of Britain. After a reign of four months, Gratian underwent the fate of his predeceſſor; and was ſucceeded by *Conſtantine*, a common ſoldier, who was choſen merely for the ſake of his name. He ſeems, however, to have been a man of ſome knowledge and experience in war. He drove the Scots and Picts beyond the limits of the Roman territories; but being elated with this ſucceſs, he would now be ſatisfied with nothing leſs than the conqueſt of the whole Roman empire. He therefore paſſed over into Gaul; and took with him not only the few Roman forces that had been left, but ſuch of the provincial Britons as were moſt accuſtomed to arms. That unhappy people, being now left entirely defenceleſs, were haraſſed in the moſt cruel manner by their enemies; who broke into the country, and deſtroyed all with fire and ſword. In this miſerable ſituation they continued from the year 407, when the uſurper Conſtantine paſſed over into Gaul, till the year 410. Having during the laſt three years frequently implored aſſiſtance from Rome without receiving any, they now reſolved to withdraw their allegiance from an empire which was no longer able to protect them. Honorius himſelf applauded their conduct; and adviſed them by letters to provide for their own ſafety, which was in effect an implicit reſignation of the ſovereignty of the iſland.

The provincial Britons now regained their liberty; but they had loſt the martial ſpirit which had at firſt rendered them ſo formidable to the Romans. They ſeem, however, to have met with ſome ſucceſs in their firſt enterpriſes; for Zoſimas tells us, that they delivered their cities from the inſults of an haughty enemy.

24
Implore the aſſiſtance of the Romans.

But being at laſt overpowered, they were again obliged to have recourſe to the Roman emperor, to whom they promiſed a moſt perfect ſubmiſſion, provided they were delivered from the hands of their mercileſs and implacable enemies. Honorius, touched with compaſſion, ſent a legion to their relief. The Roman forces landed in Britain unexpectedly; and having deſtroyed great numbers of the Scots and Picts, they drove them beyond the friths of Forth and Dunbritton. After this they adviſed the natives to build a wall on the iſthmus from ſea to ſea, and to reaſſume their courage, and defend themſelves from their enemies by their own valour. The Romans then quitted the country; being obliged to return, in order to repulſe thoſe barbarians who had broken into the empire from all quarters.

The Britons immediately ſet about building the wall, as they had been deſired, with great alacrity. But as it was conſtructed only of turf, the Scots and Picts ſoon broke it down in ſeveral places; and, pouring in upon the defenceleſs and effeminate provincials, committed more cruel ravages than ever.

25
Send ambaſſadors a ſecond time to Rome.

At laſt, after very many and grievous calamities, the latter ſent ambaſſadors once more to Rome. Theſe appeared with their garments rent and duſt on their heads; and at laſt prevailed on the emperor, by their earneſt intreaties, to ſend another legion to their relief. The troops arrived in Britain before the enemy had the leaſt knowledge of their having ſet ſail. They were therefore quite unprepared for an attack, and roving up and down the country in the utmoſt diſorder. The Romans made a terrible havock among them, and drove the remainder into their own country. As Honorius had ſent them not with any ambitious view of retaining the iſland in ſubjection, but merely out of compaſſion to the unhappy provincials, the Romans told them, they had now no farther aſſiſtance to expect from them. They informed them, that the legion muſt immediately return to the continent, to protect the empire from the barbarians, who had extended their ravages almoſt to every part of it; and therefore, that they muſt now take their laſt farewel of Britain, and totally abandon the iſland. After this declaration Gallio, the commander of the Roman troops, exhorted the provincials to defend themſelves, by fighting bravely for their country, wives, and children, and what ought to be dearer than life itſelf, their liberty; telling them, at the ſame time, that their enemies were no ſtronger than themſelves, provided they would but lay aſide their fears, and exert their ancient courage and reſolution. That they might the better withſtand the attacks of the enemy, he adviſed them to build a wall, not of turf, but of ſtone; offering to aſſiſt them with his ſoldiers, and to direct them himſelf in the execution. Upon this the Britons immediately fell to work; and with the aſſiſtance of the Romans, finiſhed it in a ſhort time, though it was no leſs than eight feet thick, and twelve feet in height. It is thought to have been built on the ſame place where Severus's wall formerly ſtood. Towers were alſo built at con-

26 Britain finally abandoned by the Romans.

venient diſtances on the eaſt coaſt, to prevent the deſcents of the Saxons and other barbarians that came from Germany. Gallio employed the reſt of his time in teaching the provincials the art of war. He left them patterns of the Roman weapons, which he alſo taught them to make; and after many encouraging exhortations, he took his laſt farewel of Britain, to which the Romans never returned. There is a great diſagreement among chronologers as to the year in which the Romans finally abandoned Britain; ſome placing it in 422; others in 423, or 426; and ſome in 431, 435, or 437.

The final departure of the Romans was no ſooner known to the Scots and Picts, than they poured in upon the provincial Britons from all quarters, like hungry wolves breaking into a ſheep-fold. When the Scots approached the new built-wall, they found it completely finiſhed, and guarded by great numbers of armed men. But ſo little had the provincial Britons profited by the military inſtructions of the Romans, that inſtead of placing proper guards and centinels, and relieving one another by turns, their whole number had ſtaid ſeveral days and nights upon the ramparts without intermiſſion. Being therefore quite benumbed and wearied out, they were able to make but very little reſiſtance.

27 Britons miſerably haraſſed by the Scots and Picts.

Many were pulled down with hooks from the battlements, and daſhed in pieces. The reſt were driven from their ſtations with ſhowers of darts and arrows. They betook themſelves to flight; but that could not ſave them. The Scots and Picts purſued them cloſe, made a dreadful havock among the fugitives, and took poſſeſſion of the frontier towns, which they found deſerted by the inhabitants. As they now met with no more oppoſition, they over-ran the whole country, putting every thing to fire and ſword. Their ravages ſoon occaſioned a famine; and this was followed by a kind of civil war. The provincials, unable to ſupport themſelves, were obliged to plunder each other of the little the common enemy had left them. The whole country at laſt became ſo incapable of ſupporting thoſe who were left in it, that many fled into the woods, in order to ſubſiſt themſelves there by hunting.

28 Implore the aſſiſtance of the Romans.

In this extremity of diſtreſs, they had once more recourſe to the Romans; and wrote in the moſt mournful ſtyle that can poſſibly be imagined to Aetius, who was then conſul the third time. Their letter they directed thus: "The groans of the Britons to the conſul Aetius." The contents of this letter were anſwerable to the direction. "The barbarians (ſay they) drive us to the ſea; the ſea drives us back to the barbarians; between which we have only the choice of two deaths, either to be ſwallowed up by the waves, or to be cruelly maſſacred by the enemy."

To this letter the Roman general gave no ſatisfactory anſwer, and the provincials were thereupon reduced to deſpair. Great numbers of them fled over to Armorica, where they ſettled along with others who had formerly gone over with an uſurper called *Maximus*; while others ſubmitted to the Scots and Picts. Some, however, more reſolute than the reſt, had once more recourſe to arms.

29 They at laſt repulſe their enemies.

They ſallied out in parties from the woods and caves where they had been obliged to hide themſelves, and, falling unexpectedly on the enemy, cut great numbers of them in pieces, and obliged the reſt to retire. Having thus obtained ſome reſpite, they began again to cultivate their lands; which, having lain fallow for a long time, now produced all ſorts of corn in the greateſt plenty. This plenty, according to the hiſtorian Gildas, occaſioned the moſt conſummate wickedneſs and corruption of manners among all ranks of men. The clergy, ſays he, who ſhould have reclaimed the laity by their example, proved the ringleaders in every vice; being addicted to drunkenneſs, contention, envy, &c.—It is poſſible, however, that this deſcription might be exaggerated by Gildas, who was himſelf a monk. But however this was, the Britons had not long enjoyed peace, when they were alarmed by a report, that the Scots and Picts were about to return with a far greater force than before, utterly to extirpate the name of their ſouthern neighbours, and ſeize upon the country for themſelves.

30 Are aga
threaten
with an
vaſion.

This report threw them into a terrible conſternation; and to add to the reſt of their misfortunes, they were now viſited by a dreadful plague, which raged with ſuch violence, that the living were ſcarce ſufficient to bury the dead. The contagion no ſooner ceaſed, than they found their country invaded by the Scots and Picts, who deſtroyed every thing with fire and ſword; ſo that the provincials were ſoon reduced to the ſame miſerable ſtate they had formerly been in.

At this time the chief, if not the only, king of the ſouthern diviſion of Britain, was one *Vortigern*. He is ſaid to have been a cruel, debauched tyrant, regardleſs of the public welfare, and totally incapable of promoting it. Being now rouſed from his ſenſibility, however, by a ſenſe of his own danger, he ſummoned a council of the chief men of the nation, in order to deliberate about the proper means for delivering the country from thoſe calamities under which it groaned.

31 They r
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In this council the moſt pernicious meaſure was adopted that could poſſibly have been reſolved on; namely, to invite to their aſſiſtance the *Saxons*, a people famous for their piracies and cruelty, and juſtly dreaded by the Britons themſelves *. This fatal expedient being agreed upon, ambaſſadors were immediately diſpatched into Germany with advantageous propoſals to the Saxons in caſe they would come over to their aſſiſtance.

The Britiſh ambaſſadors ſoon arrived in Germany, and, according to Witichind, a Saxon hiſtorian of the ninth century, made the following ſpeech before an aſſembly of the Saxons.—"Illuſtrious Saxons, the fame of your victories having reached our ears, the diſtreſſed Britons, haraſſed by the continual inroads of a neighbouring enemy, ſend us to implore your aſſiſtance. We have a fertile and ſpacious country, which we are commanded to ſubmit to you. We have hitherto lived under the protection of the Roman empire; but our ancient maſters having abandoned us, we know no nation more powerful than you, and better able to protect us. We therefore recur to your valour. Forſake us not in our diſtreſs, and we ſhall readily ſubmit to what terms you yourſelves ſhall think fit to preſcribe to us."—If this abject and ſhameful ſpeech was really made, it muſt give us a very ſtrange idea of the national ſpirit of the provincial Britons at that time. It is, however, probable that the whole is a fiction, deſigned only to excuſe the perfidious treatment which theſe Britons afterwards received from the Saxons,

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* See
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Saxons. The moſt reſpectable even of the Saxon hiſtorians make no mention of ſuch a ſpeech; and it is certain, that when the Saxons themſelves wanted to quarrel with the Britons, they never inſiſted upon the promiſe made by the Britiſh ambaſſadors; which they moſt certainly would have done, had any ſuch promiſe ever been made.

The Britiſh ambaſſadors were very favourably received by the Saxons. The latter embraced their propoſal with joy; and the rather, becauſe their ſoothſayers foretold that they ſhould plunder their Britiſh allies for 150 years, and reign over them for twice that time. Three long ſhips, in the Saxon language called *chiules*, were therefore fitted out, under the conduct of Hengiſt and Horſa. Theſe were two brothers much celebrated both for their valour and nobility. They were ſons of Witigiſil, ſaid to be great-grandſon to the Saxon god Woden; a circumſtance which added much to their authority. Having embarked about 1600 men on board their three veſſels, the two brothers arrived in the iſle of Thanet, in the year 449 or 450.

2 Saxons e in in, and t the and

They were received by the inhabitants with the greateſt demonſtrations of joy: the iſle in which they had landed was immediately appointed for their habitation; and a league was concluded, in virtue of which the Saxons were to defend the provincial Britons againſt all foreign enemies; and the provincials were to allow the Saxons pay and maintenance, beſides the place allotted them for their abode. Soon after their arrival, king Vortigern led them againſt the northern nations who had lately broke into the kingdom, and advanced as far as Stanford in the county of Lincolnſhire. Here a battle was fought, in which the Scots and Picts were utterly defeated, and obliged to relinquiſh their booty.

Vortigern was ſo highly pleaſed with the behaviour of his new allies, that he beſtowed large poſſeſſions in the country they had newly delivered, upon the two commanders Hengiſt and Horſa. It is ſaid, that, even at this time, Hengiſt was taken with the wealth and fertility of the country; and at the ſame time obſerving the inhabitants to be quite enervated with luxury, began to entertain hopes of conquering part of it. He therefore, with Vortigern's conſent, invited over ſome more of his countrymen; giving them notice at the ſame time of the fruitfulneſs of the country, the effeminacy of the inhabitants, and how eaſily a conqueſt might be effected.

3 ſup- of ns ar-

The Saxons readily complied with the invitation; and, in 452, as many more arrived in 17 veſſels, as, with thoſe already in Britain, made up an army of 5000 men. Along with theſe, according to Nennius, came over Rowena the daughter of Hengiſt. Vortigern fell in love with this lady; and in order to obtain her in marriage, divorced his lawful wife. Hengiſt pretended to be averſe to the match; but Vortigern obtained his conſent by inveſting him with the ſovereignty of Kent. The Saxon hiſtorians, indeed, make no mention of Rowena; but rather inſinuate, that their countrymen made themſelves maſters of Kent by force of arms. It ſeems moſt probable, however, that Vortigern had as yet continued in friendſhip with the Saxons, and even put more confidence in them than in his own ſubjects. For, not long after the arrival of this firſt reinforcement, Hengiſt obtained leave to ſend for a ſecond, in order, as was pretended, to defend the king from the attempts of his rebellious ſubjects, as well as of the Scots and Picts. Theſe embarked in 40 ſhips, under the command of Octa and Ebuſa, the ſon and nephew, or, according to ſome, the brother and nephew of Hengiſt. They landed at the Orkney iſlands; and having ravaged them, as well as all the northern coaſts of Scotland, they conquered ſeveral places beyond the Frith, and at laſt obtained leave to ſettle in Northumberland.

34 They quarrel with the Britons.

The pretence made for this ſettlement was, that the Saxons under Octa and Ebuſa might defend the northern frontiers of the kingdom, as thoſe under Hengiſt and Horſa did the ſouthern parts. Many more Saxons were, under various pretences, invited over; till at laſt the countries from which they came were in a manner depopulated. And now their numbers being greatly increaſed, the Saxons began to quarrel with the natives. They demanded larger allowances of corn, and other proviſions; threatening to lay waſte the whole country if their demands were not complied with. The Britons, inſtead of complying with theſe demands, deſired them to return home, ſince their numbers exceeded what they were able to maintain. Upon this, the Saxons concluded a peace with the Scots and Picts; and, turning their arms againſt the unhappy provincials, over-ran the whole country. The Saxons committed every where the greateſt cruelties. All buildings, whether public or private, they levelled with the ground. The cities were pillaged and burnt; and the people maſſacred without diſtinction of ſex or age, and that in ſuch numbers, that the living ſcarce ſufficed to bury the dead. Some of thoſe who eſcaped the general ſlaughter, took refuge among inacceſſible rocks and mountains; but there great numbers periſhed with hunger, or were forced to ſurrender themſelves as ſlaves to their enemies. Some croſſed the ſea and ſettled either in Holland or in Armorica, now the province of Brittany in France.

35 They are defeated and driven out by Vortimer.

Vortigern, we are told by Nennius, was ſo far from being reclaimed by theſe calamities, that he added inceſt to his other crimes, and married his own daughter. At laſt, his own ſubjects, provoked at his enormous wickedneſs, and the partiality he ſhowed to the Saxons, depoſed him, and raiſed his ſon Vortimer to the throne. He was a young man of great valour, and willingly undertook the defence of his diſtreſſed country. He firſt fell upon the Saxons with what troops he could aſſemble, and drove them into the iſle of Thanet. Here they were beſieged, till, being reinforced by freſh ſupplies from Germany, they opened themſelves a way through the Britiſh troops. Vortimer, however, was not yet diſheartened. He engaged the Saxons on the banks of the Derwent in Kent, where he obtained a complete victory, and cut in pieces great numbers of the enemy. Another battle was fought at Aylesford in Kent. Some aſcribe the victory at this time to the Saxons, and ſome to the Britons. It is certain, however, that Horſa the brother of Hengiſt was killed in this engagement. He is ſaid to have been buried at a place in the neighbourhood, which from him obtained the name of *Horſted*.—A third battle was fought, in which the victory was uncertain, as is alſo the place where it happened. The fourth battle, however, according to Nennius, proved deciſive

deciſive in favour of the Britons. Vortimer engaged his enemies, according to ſome, at Folkſtone; according to others, at a place called *Stonar*, in the iſle of Thanet. The Saxons were defeated with great ſlaughter, and driven back to their ſhips. So complete is this victory ſaid to have been, that the Saxons quitted the iſland, without making any attempt upon it for five years afterwards. Theſe battles, however, reſt entirely upon the credit of Nennius, and the hiſtorians who have followed him. They are taken notice of neither by Gildas nor Bede. The former only acquaints us, that the Saxons retired. This, by moſt hiſtorians, is underſtood of their returning home; tho' it is poſſible he might mean no more, than that, after they had laid waſte the country, they retired into the territories allotted them by Vortigern, in Kent and Northumberland.

Vortimer is ſaid to have died after a reign of ſix years. On his death-bed, he deſired his ſervants to bury him near the place where the Saxons uſed to land; being perſuaded, that the virtue of his bones would effectually prevent them from ever touching the Britiſh ſhore. This command, however, was neglected; and Vortimer was buried at Lincoln, according to ſome, or London, according to others. Hengiſt was no ſooner informed of his death, than he invaded Britain anew with a numerous body of Saxons. He was oppoſed by Vortigern, who had been reſtored to the throne after the death of his ſon Vortimer. Several battles were fought on this occaſion; but at laſt the provincials being overthrown at a place called *Crecanford*, with the loſs of 4000 men, were obliged to abandon Kent to their enemies, and retire to London. This happened about the year 458 or 459; and from this time moſt hiſtorians date the erection of the firſt Saxon kingdom in Britain, viz. that of Kent. Hengiſt aſſumed the title of *king*, and choſe Eſk his ſon for his colleague.

36
They return and defeat the Britons, and erect a kingdom in Kent.

The Britons under Vortigern ſtill continued the war. Hengiſt finding himſelf unable to gain a deciſive advantage over them in the field, had recourſe to treachery. He pretended to be deſirous of concluding a peace with the Britiſh monarch, and of renewing his ancient friendſhip with him; and therefore required an interview. To this Vortigern readily conſented, and accepted of an entertainment prepared for him by Hengiſt. The king was attended by 300 nobility all unarmed, but the Saxons had concealed daggers below their garments. The Britiſh nobility were all treacherouſly maſſacred in the height of their mirth; Vortigern himſelf was taken and put in fetters; nor could his liberty be procured, but by ceding to the Saxons thoſe provinces now called *Eſſex*, *Suſſex*, and *Middleſex*. Thus the Saxons got ſuch a footing in Britain that they could never afterwards be expelled. Vortigern, after being ſet at liberty, is ſaid to have retired to a vaſt wilderneſs near the fall of the Wye in Radnorſhire, where he was ſome time after conſumed by lightning, together with a city called *Kaer Gourtigern* which he had built in that place.

37
Treachery of the Saxons.

On the retreat of Vortigern, the command of the Britiſh forces devolved upon Aurelius Ambroſius, or, as Gildas calls him, Ambroſius Aurelianus. He was a Roman, and perhaps the laſt that remained in the iſland. He is ſaid to have gained ſeveral victories over the Saxons. Notwithſtanding this, however, they ſtill continued to gain ground; and in the year 491, the foundation of a ſecond Saxon kingdom was laid in Britain. This at firſt comprehended only the county of Suſſex, but ſoon after extended over moſt of the countries lying ſouth of the Humber. It was called the *kingdom of the South Saxons*.

38
Second
on king
dom.

The German nations being now informed of the good ſucceſs which had attended the Saxons in Britain, new adventurers daily flocked over to ſhare the good fortune of the others. They were chiefly compoſed of three nations, the Saxons, Angles, and Jutes. All theſe paſſed under the common appellation ſometimes of *Saxons*, ſometimes of *Angles*. They ſpoke the ſame language, and agreed very much in their cuſtoms and inſtitutions, ſo that all of them were naturally led to combine againſt the natives. The moſt active of theſe adventurers was Cerdic a Saxon, ſaid to be the tenth in deſcent from Woden. He landed with his ſon Cenric, and as many men as he could convey in five ſhips, at Yarmouth in Norfolk. The provincials immediately attacked him with great vigour; but after a ſhort engagement, they were totally defeated. Many other battles were fought, the event of which was always favourable to the Saxons, ſo that the Britons were forced to abandon their ſea-coaſts to them.

In 497, *Porta*, another Saxon, with his two ſons *Bleda* and *Magla*, arrived at *Portſmouth*, ſo called, as ſome imagine, from this chieftain. The provincials, under the command of a young prince a native of the country, attempted to oppoſe the landing of the Saxons: but his army was defeated with great ſlaughter, and he himſelf killed in the engagement; after which Porta made himſelf maſter of all the neighbouring country. The progreſs of Cerdic, however, alarmed the Britons more than that of all the other Saxon princes. About the year 508, therefore, *Nazaleod*, ſtyled, by Henry of Huntingdon, the *greateſt of all the Britiſh kings*, aſſembled almoſt the whole ſtrength of the provincial Britons in order to drive him out of the iſland. Cerdic on the other hand took care to ſtrengthen himſelf by procuring aſſiſtance from all the Saxons already in the iſland. He then advanced againſt the Britons, commanding the right wing himſelf, and his ſon Cenric the left. As the two armies drew near each other, Nazaleod perceived the enemy's right wing to be much ſtronger than the left. He therefore attacked it with the flower of his army; and after an obſtinate reſiſtance, obliged Cerdic to ſave himſelf by flight. Being too eager in the purſuit, however, Cenric fell upon his rear, and the battle was renewed with great vigour. The Britiſh army was at laſt entirely defeated; and 5000 men, among whom was Nazaleod himſelf, were left dead on the ſpot.

39
Nazale
king
Britain
feated a
killed.

Who ſucceeded Nazaleod in the kingdom of Britain, is not known. The Welſh annals leave an interregnum of about ſix years; after which they place the beginning of the reign of Arthur, the moſt renowned Britiſh prince mentioned in hiſtory. The hiſtory of king Arthur is ſo much obſcured by fables, and many abſurd, romantic, and ridiculous ſtories, that ſome have ſuppoſed that no ſuch perſon ever exiſted. On this ſubject Milton gives the following reaſons againſt the exiſtence of king Arthur: 1. He is not mentioned by Gildas,

40
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Arthur
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Gildas, or any Britiſh hiſtorian except Nennius, who is allowed on all hands to have been a very credulous writer, and to have publiſhed a great many fables. 2. Though William of Malmeſbury and Henry of Huntingdon have both related his exploits, yet the latter took all he wrote from Nennius; and the former, either from the ſame fabulous writer, or ſome Monkiſh legends in the abbey of Glaſtenbury; for both theſe writers flouriſhed ſeveral centuries after king Arthur. 3. In the pretended hiſtory of Geoffroy of Monmouth, ſuch contradictions occur concerning this monarch's victories in France, Scotland, Ireland, Norway, Italy, &c. as muſt cauſe us to look upon him as an hero altogether fabulous and romantic.

In anſwer to this it has been ſaid, 1. That his not being mentioned by Gildas cannot ſeem ſtrange to us, ſeeing it was not that author's deſign to write an exact hiſtory of his country, but only to give a ſhort account of the cauſes of its ruin by the Scots, Picts, and Saxons. He had alſo a particular ſyſtem to ſupport, namely, That the ruin of the Britons was owing to the judgements of God upon them for their wickedneſs. He lies therefore under a great temptation to conceal the ſucceſſes of the Britons, and to relate only their miſfortunes. 2. Though Nennius was a credulous writer, it is unreaſonable to think that the whole hiſtory of king Arthur was an invention of his. It is more probable that he copied it from other more ancient authors, or took it from the common tradition of his countrymen. That the Saxon annals make no mention of this king is not to be wondered at, ſeeing it is natural to think that they would wiſh to conceal the many defeats he gave their nation 3. The moſt convincing proof of the exiſtence of king Arthur is, that his tomb was diſcovered at Glaſtenbury in Somerſetſhire, and his coffin dug up, in the reign of Henry II. with the following inſcription upon it in Gothic characters: "Hic jacet ſepultus inclytus rex Arturius in inſula Avalonia." We are told that on his body were plainly to be ſeen the marks of 10 wounds, only one of which ſeemed to be mortal.

This renowned prince is ſaid to have defeated the Saxons under Cerdic in 12 pitched battles. The laſt of theſe was fought on Badon-hill, ſuppoſed to be Banſdown near Bath; in which the Saxons received ſuch a terrible overthrow, that for many years they gave the Britons no further moleſtation. As new ſupplies of Saxons, however, were continually flocking over, a third and fourth kingdom of them were ſoon formed. The third kingdom comprehended the counties of Devon, Dorſet, Somerſet, Wiltſhire, Hampſhire, and Berkſhire; to which was afterwards added Cornwal. This was called the *kingdom of the Weſt Saxons*. The other kingdom, which was called the *kingdom of the Eaſt Saxons*, comprehended Eſſex, Middleſex, and part of Hertfordſhire.

In the year 542, happened the death of the great king Arthur, ſaid to have been killed in battle with a treacherous kinſman of his own. Five years afterwards, was erected the Saxon kingdom of Northumberland. It extended, however, much farther than the preſent bounds of that country; for it comprehended all Yorkſhire, Lancaſhire, Durham, Cumberland, Weſtmoreland, amd Northumberland, with part of Scotland, as far as the frith of Forth. Between theſe Saxon, kings frequent contentions now aroſe; by which means the Britons enjoyed an uninterrupted tranquillity for at leaſt 44 years. This interval, however, according to Gildas, they employed only in corrupting their manners more and more, till at laſt they were rouſed from their ſecurity by the ſetting up of a ſixth Saxon kingdom, called the kingdom of the *Eaſt Angles*. It was founded in 575, and comprehended the counties of Norfolk, Suffolk, Cambridgeſhire, and the Iſle of Ely. The Saxons once more attacked the Britons, and overthrew them in many battles. The war was continued for ten years; after which, another Saxon kingdom called *Mercia* was ſet up. It comprehended 17 counties; viz. Glouceſter, Hereford, Worceſter, Warwick, Leiceſter, Rutland, Northampton, Lincoln, Huntington, Bedford, Buckingham. Oxford, Stafford, Nottingham, Derby, Shropſhire, Cheſhire, and part of Hertfordſhire.

43
The Britons defeat the Saxons, but are obliged to retire into Wales.

The provincial Britons were now confined within very narrow bounds. However, before they entirely gave up the beſt part of their country to their enemies, they once more reſolved to try the event of a battle. At this time they were aſſiſted by the Angles, who were jealous of the overgrown power of the Weſt Saxons. The battle was fought in Wiltſhire, at Woden's Bearth, a place near the ditch called *Wanſdike* or *Wodenſdike*; which runs through the middle of the county. The battle was very obſtinate and bloody; but at laſt the Saxons were entirely defeated, and almoſt their whole army cut off. The victory, however, proved of little ſervice to the Britons: for being greatly inferior in number to the Saxons, and haraſſed by them on the one ſide, and by the Scots and Picts on the other, they were daily more and more confined; and at laſt obliged to take refuge among the craggy and mountainous places in the weſt of the iſland, where their enemies could not purſue them. At firſt they poſſeſſed all the country beyond the rivers Dee and Severn, which anciently divided Cambria, or Wales, from England; the towns which ſtand on the eaſtern banks of theſe rivers having moſtly been built in order to reſtrain the incurſions of the Welſh. But the Engliſh, having paſſed the Severn, by degrees ſeized on the country lying between that river and the Wye. Nay, in former time, ſome parts of Flintſhire and Denbighſhire were ſubject to the kings of Mercia: for Uffa, the moſt powerful king of that country, cauſed a deep ditch to be drawn, and a high wall built, as a barrier between his dominions and the territories of the Welſh, from the mouth of the Dee, a little above Flint-caſtle, to the mouth of the Wye. This ditch is ſtill to be ſeen in ſeveral places; and is called by the Welſh *Claudh Uffa*, or the Ditch of Uffa. The inhabitants of the towns on the eaſt ſide of this ditch are called by the ſame people *Guyr y Mers*; that is, the men of Mercia.

44
Account of the heptarchy.

Thus, after a violent conteſt of near 150 years, the Saxons entirely ſubdued the Britons whom they had come to defend, and had erected ſeven independent kingdoms in England, now commonly denominated the *Saxon Heptarchy*. By theſe conquerors the country was now reduced to a degree of barbarity almoſt as great as it had been in when firſt invaded by the Romans. The provincial Britons, during their ſubjection to that people, had made conſiderable advances in civilization.

vilization. They had built 28 conſiderable cities, beſides a number of villages and country-ſeats; but now theſe were all levelled with the ground, the native inhabitants who remained in England were reduced to the moſt abject ſlavery, and every art and ſcience totally extinguiſhed among them.

Before theſe fierce conquerors could be civilized in any degree, it was neceſſary that all the ſeven kingdoms ſhould be reduced under one head; for as long as they remained independent, their continual wars with each other ſtill kept them in the ſame ſtate of barbarity and ignorance.

The hiſtory of theſe ſeven kingdoms affords no event that can be in the leaſt intereſting. It conſiſts only of a detail of their quarrels for the ſovereignty. This was at laſt obtained by Egbert king of the Weſt Saxons, or Weſſex, in 827. Before this time, Chriſtianity had been introduced into almoſt all the kingdoms of the heptarchy; and however much corrupted it might be by coming through the impure channel of the church of Rome, and miſunderſtood through the ignorance of thoſe who received it, it had conſiderably ſoftened the barbarous manners of the Saxons. It had alſo opened a communication between Britain and the more polite parts of Europe, ſo that there was now ſome hope of the introduction of arts and ſciences into this country. Another effect was, that, by the ridiculous notions of preſerving inviolable chaſtity even between married people, the royal families of moſt of the kingdoms were totally extinct; and the people, being in a ſtate of anarchy, were ready to ſubmit to the firſt who aſſumed any authority over them.

All theſe things contributed to the ſucceſs of Egbert in uniting the heptarchy under his own dominion. He was of the royal family of Weſſex; and a nearer heir than Brithric, who had been raiſed to the kingdom in 784. As Egbert was a prince of great accompliſhments, Brithric, knowing that he had a better title to the crown than himſelf, began to look upon him with a very jealous eye. Young Egbert, ſenſible of his danger, privately withdrew to France; where he was well received by Charlemagne, the reigning monarch. The French were reckoned at this period the moſt valiant and polite people in Europe; ſo that this exile proved of great ſervice to Egbert.

He continued at the court of France till he was recalled by the nobility to take poſſeſſion of the kingdom of Weſſex. This recal was occaſioned by the following accident. Brithric the king of Weſſex had married Eadburga, natural daughter of Offa king of Mercia; a woman infamous for cruelty and incontinence. Having great influence over her huſband, ſhe often perſuaded him to deſtroy ſuch of the nobility as were obnoxious to her; and where this expedient failed, ſhe herſelf had not ſcrupled to become their executioner. She had mixed a cup of poiſon for a young nobleman, who had acquired a great ſhare of her huſband's friendſhip: but, unfortunately, the king drank of the fatal potion along with his favourite, and ſoon after expired. By this and other crimes Eadburga became ſo odious to the people, that ſhe was forced to fly into France, whence Egbert was at the ſame time recalled, as above mentioned.

Egbert aſcended the throne of Weſſex in the year 799. He was the ſole deſcendant of thoſe conquerors who firſt invaded Britain, and who derived their pedigree from the god Woden. But though this circumſtance might have given him great advantages in attempting to ſubdue the neighbouring kingdoms, Egbert for ſome time gave them no diſturbance; but turned his arms againſt the Britons, who had retired into Cornwall, whom he defeated in ſeveral battles. He was recalled from his conqueſts in that country, by hearing that Bernulf king of Mercia had invaded his dominions. Egbert quickly led his army againſt the invaders, whom he totally defeated at Ellendun in Wiltſhire. He then entered their kingdom on the ſide of Oxfordſhire with an army, and at the ſame time ſent his eldeſt ſon Ethelwolf with another into Kent. The young prince expelled Baldred the tributary king of Kent, and ſoon made himſelf maſter of the country. The kingdom of Eſſex was conquered with equal eaſe; and the Eaſt Angles, who had been reduced under ſubjection by the Mercians, joyfully put themſelves under the protection of Egbert. Bernulf himſelf marched againſt them, but was defeated and killed; and Ludecan his ſucceſſor met with the ſame fate two years after.

Theſe misfortunes greatly facilitated the reduction of Mercia. Egbert ſoon penetrated into the very heart of the Mercian territories, and gained an eaſy victory over a diſpirited and divided people; but in order to engage them to ſubmit with the leſs reluctance, he allowed Wiglef, their countryman, to retain the title of *king*, whilſt he himſelf exerciſed the real power of a ſovereign. Northumberland was at preſent in a ſtate of anarchy: and this tempted Egbert to carry his victorious arms into that kingdom alſo. The inhabitants, being deſirous of living under a ſettled form of government, readily ſubmitted, and owned him for their ſovereign. To them, however, he likewiſe allowed the power of electing a king; who paid him a tribute, and was dependent on him.

4
Egber
firſt k
Engl

Egbert became ſole maſter of England about the year 827. A favourite opportunity was now offered to the Anglo-Saxons of becoming a civilized people, as they were at peace among themſelves, and ſeemed free from any danger of a foreign invaſion. But this flattering proſpect was ſoon overcaſt. Five years after Egbert had eſtabliſhed his new monarchy, the Danes landed in the iſle of Shepey, plundered it, and then made their eſcape with ſafety. Encouraged by this ſucceſs, next year they landed from a fleet of 35 ſhips. They were encountered by Egbert at Charmouth in Dorſetſhire. The battle was obſtinate and bloody. Great numbers of the Danes were killed, but the reſt made good their retreat to their ſhips. They next entered into an alliance with the Britons of Cornwall; and landing two years after in that country, they made an irruption into Devonſhire. Egbert met them at Hengeſdown, and totally defeated them; but before he had time to form any regular plan for the defence of the kingdom, he died, and left the government to his ſon Ethelwolf.

4
Daniſ
vaſion

Ethe

The new king was weak and ſuperſtitious. He began with dividing the kingdom, which had ſo lately been united, with his ſon Athelſtan. To the young prince he gave the counties of Eſſex, Kent, and Suſſex. But though this diviſion might have been productive of of bad conſequences at another time, the fear of the Danes kept every thing quiet for the preſent. Theſe barbarians had ſome how or other conceived ſuch hopes of enriching themſelves by the plunder of England, that they ſcarce ever failed of paying it an annual viſit. The Engliſh hiſtorians tell us, that they met with many ſevere repulſes and defeats; but on the whole it appears that they had gained ground: for in 851 a body of them took up their winter-quarters in England. Next year they received a ſtrong reinforcement of their countrymen in 350 veſſels; and advancing from the iſle of Thanet, where they had ſtationed themſelves, they burnt the cities of London and Canterbury. Having next put to flight Brichtric the governor of Mercia, they marched into the heart of Surry, laying waſte the whole country through which they paſſed.

Ethelwolf, though naturally little fitted for military enterpriſes, was now obliged to take the field. He marched againſt the Danes at the head of the Weſt Saxons, and gained an indeciſive and bloody victory over his enemies. The Danes ſtill maintained their ſettlement in the iſle of Thanet. They were attacked by Ealher and Huda, governors of Kent and Surry; both of whom they defeated and killed. Afterwards they removed to the iſle of Shepey, where they took up their winter-quarters, with a deſign to extend their ravages the next year.

The deplorable ſtate of the kingdom did not hinder Ethelwolf from making a pilgrimage to Rome, whither he carried his fourth and favourite ſon Alfred, then only ſix years of age. He paſſed a twelvemonth in that city; made preſents to the principal eccleſiaſtics there; and made a grant of 300 mancuſes (a ſilver coin about the weight of our half-crown) annually to the ſee of Rome. One-third of this was to ſupport the lamps of St Peter's, another thoſe of St Paul's, and the third was for the Pope himſelf. In his return to England, Ethelwolf married Judith, daughter of the emperor Charles the Bald; but when he landed, he found himſelf deprived of his kingdom by his ſon Ethelbald. That prince aſſumed the government of Athelſtan's dominions, who was lately dead; and, with many of Ethelwolf's nobles, formed a deſign of excluding him from the throne altogether, on account of his weakneſſes and ſuperſtitions. Ethelwolf, however, delivered the people from the calamities of a civil war, by dividing the kingdom with his ſon. He gave to Ethelbald the goverment of the weſtern, and reſerved to himſelf that of the eaſtern part of the kingdom. Immediately after this, he ſummoned the ſtates of the whole kingdom, and conferred on the clergy a perpetual donation of tythes, for which they had long contended, and which had been the ſubject of their ſermons for ſeveral centuries.

This conceſſion was deemed ſo meritorious by the Engliſh, that they now thought themſelves ſure of the favour of heaven; and therefore neglected to uſe the natural means for their ſafety which they might have done. They even agreed, that, notwithſtanding the deſperate ſituation of affairs at preſent, the revenues of the church ſhould be exempted from all burdens, though impoſed for the immediate ſecurity and defence of the nation. Ethelwolf died two years after he had made the above mentioned grant, and left the kingdom to his two eldeſt ſons Ethelbald and Ethelbert. Both theſe princes died in a few years, and left the kingdom to Ethered their brother, in the year 866.

48
Ethered.

The whole courſe of Ethered's reign was diſturbed by the irruptions of the Danes. The king defended himſelf againſt them with great bravery, being ſeconded in all his military enterprizes by his younger brother Alfred, who afterwards aſcended the throne. In this reign, the Danes firſt landed among the Eaſt Angles. That people treacherouſly entered into an alliance with the common enemy; and furniſhed them with horſes, which enabled them to make an irruption into Northumberland. There they ſeized upon the city of York. Oſbricht and Ælla, two Northumbrian princes who attempted to reſcue the city, were defeated and killed. Encouraged by this ſucceſs, the Danes penetrated into the kingdom of Mercia, took up their winter-quarters at Nottingham, and thus threatened the kingdom with a final ſubjection. From this poſt, however, they were diſlodged by Ethered and Alfred, who forced them to retire into Northumberland. Their reſtleſs and ſavage diſpoſition, however, did not ſuffer them to continue long in one place. They broke into Eaſt Anglia; defeated and took priſoner Edmund the tributary king of that country, whom they afterwards murdered; and committed every where the moſt barbarous ravages. In 871, they advanced to Reading; from whence they infeſted the neighbouring country by their incurſions. The Mercians, deſirous of recovering their independency, refuſed to join Ethered with their forces; ſo that he was obliged to march againſt the Danes, attended only by the Weſt Saxons, who were his hereditary ſubjects. Several actions enſued, in which the Danes are ſaid to have been unſucceſsful; but being continually reinforced from their own country, they became every day more and more formidable to the Engliſh. During the confuſion and diſtreſs in which the nation was now neceſſarily involved, king Ethered died of a wound he had received in an action with the Danes; and left to his brother Alfred the kingdom almoſt totally ſubdued by a foreign power.

49
Alfred the Great.

Alfred, who may properly be called the founder of the Engliſh monarchy, aſcended the throne in the year 871, being then only 22 years of age. His great virtues and ſhining talents ſaved his country from ruin, which ſeemed almoſt unavoidable. His exploits againſt the Danes, his dangers and diſtreſſes, are related under the article ALFRED. Having ſettled the nation in a much better manner than could have been expected, he died in 901, leaving the kingdom to his ſecond ſon Edward the Elder.

50
Edward the elder.

The beginning of this monarch's reign was diſturbed by thoſe inteſtine commotions from which the wiſe and politic Alfred had taken ſo much pains to free the nation. Ethelwald, ſon to king Ethelbert, Alfred's elder brother, claimed a right to the throne. Having armed his partiſans, he took poſſeſſion of Winburne, where he ſeemed determined to hold out to the laſt extremity. On the approach of Edward, however, with a powerful army, he firſt fled into Normandy, and afterwards into Northumberland. He hoped to find the Northumbrians ready to join him, as moſt of them were Danes, lately ſubdued by Alfred, and very impatient of peace. The event did not diſappoint his expectations. The Northumbrians declared for him; and Ethelwald having thus connected himſelf with the Daniſh tribes, went beyond ſea, whence he returned with a great body of theſe banditti. On his return, he was joined by the Danes of Eaſt Anglia and Mercia. Ethelwald, at the head of the rebels, made an irruption into the counties of Glouceſter, Oxford, and Wilts; and having ravaged the country, retired with his booty before the king could approach him. Edward, however, took care to revenge himſelf, by conducting his forces into Eaſt Anglia, and ravaging it in like manner. He then gave orders to retire; but the Kentiſh men, greedy of more plunder, ſtaid behind, and took up their quarters at Bury. Here they were aſſaulted by the Danes; but the Kentiſhmen made ſuch an obſtinate defence, that though their enemies gained the victory, it was bought by the loſs of their braveſt men, and, among the reſt, of the uſurper Ethelwald himſelf.

The king, now freed from the attempts of ſo dangerous a rival, concluded an advantageous peace with the Eaſt Angles. He next ſet about reducing the Northumbrians; and for this purpoſe equipped a fleet, hoping that thus they would be induced to remain at home to defend their own country, without attempting to invade his territories. He was diſappointed in his expectations. The Northumbrians were more eager to plunder their neighbours than to ſecure themſelves. Imagining that the whole of Edward's forces were embarked on board his fleet, they entered his territories with all the troops they could raiſe. The king, however, was better prepared for them than they had expected. He attacked them on their return at Tetenhall in the county of Stafford, put them to flight, recovered all the booty, and purſued them with great ſlaughter into their own country.

The reſt of Edward's reign was a ſcene of continued and ſucceſsful action againſt the Northumbrians, Eaſt Angles, the Danes of Mercia, and thoſe who came from their native country in order to invade England. He put his kingdom in a good poſture of defence, by fortifying the towns of Cheſter, Eddeſbury, Warwick, Cherbury, Buckingham, Towceſter, Maldon, Huntingdon, and Colcheſter. He vanquiſhed Thurketill a Daniſh chieftan, and obliged him to retire with his followers into France. He ſubdued the Eaſt Anglians, Northumbrians, and ſeveral tribes of the Britons; and even obliged the Scots to make ſubmiſſions. He died in 925, and was ſucceeded by Athelſtan his natural ſon.

51 Athelſtan.

This prince, notwithſtanding his illegitimate birth, aſcended the throne without much oppoſition, as the legitimate children of Edward were too young to rule a nation ſo much liable both to foreign invaſions and domeſtic troubles as England at preſent was. One Alfred, however, a nobleman of conſiderable power, entered into a conſpiracy againſt him. It is ſaid, that this nobleman was ſeized upon ſtrong ſuſpicions, but without any certain proof. He offered to ſwear to his innocence before the pope; and in thoſe ages it was ſuppoſed that none could take a falſe oath in preſence of ſuch a ſacred perſon, without being viſited by an immediate judgment from God. Alfred was accordingly conducted to Rome, and took the oath required of him before Pope John. The words were no ſooner pronounced, than he fell into convulſions, of which he expired in three days. The king, fully convinced of his guilt, confiſcated his eſtate, and made a preſent of it to the monaſtery of Malmeſbury.

This accident proved the means of eſtabliſhing the authority of Athelſtan in England. But finding the Northumbrians bore the Engliſh yoke with impatience, he gave Sithric, a Daniſh nobleman, the title of king of Northumberland; and in order to ſecure his friendſhip, gave him his own ſiſter Editha in marriage. This was productive of bad conſequences. Sithric died the year after his marriage with Editha; upon which Anlaf and Godfrid, Sithric's ſons by a former marriage, aſſumed the ſovereignty without waiting for Athelſtan's conſent. They were, however, ſoon obliged to yield to the ſuperior power of that monarch. The former fled to Ireland; and the latter to Scotland, where he was protected by Conſtantine king of that country. The Scottiſh monarch was continually importuned by Athelſtan to deliver up his gueſt, and even threatened with an invaſion in caſe he did not comply. Conſtantine, deteſting this treachery, adviſed Godfrid to make his eſcape. He did ſo, turned pirate, and died ſoon after. Athelſtan, however, reſenting this conduct of Conſtantine, invaded his kingdom, and reduced him, it is ſaid, ſo low, that he was obliged to make the moſt humble ſubmiſſions. This, however, is denied by all the Scottiſh hiſtorians.

52 Defeats enemies.

Conſtantine, after the departure of Athelſtan, entered into a confederacy with Anlaf, who ſubſiſted by his piracies, and with ſome of the Welſh princes who were alarmed at the increaſe of Athelſtan's power. All theſe confederates made an irruption into England at once; but Athelſtan meeting them at Brumſbury in Northumberland, gave them a total overthrow. Anlaf and Conſtantine made their eſcape with difficulty, leaving the greateſt part of their men dead on the field of battle. After this period, Athelſtan enjoyed his crown in tranquillity. He died in 941, after a reign of 16 years. He paſſed a remarkable law, for the encouragement of commerce; *viz.* that a merchant, who had made three long ſea-voyages on his own account, ſhould be admitted to the rank of a thane or gentleman.

53 Edmund

Athelſtan was ſucceeded by his brother Edmund. On his acceſſion, he found the kingdom diſturbed by the reſtleſs Northumbrians, who watched for every opportunity of riſing in rebellion. They were, however, ſoon reduced; and Edmund took care to enſure the peace of the kingdom, by removing the Danes from the towns of Mercia where they had been allowed to ſettle, becauſe it was found that they took every opportunity to introduce foreign Danes into the kingdom. He alſo conquered Cumberland from the Britons. This country, however, he beſtowed upon Malcolm king of Scotland, upon condition that he ſhould do homage for it, and protect the north of England from all future incurſions of the Danes.

54 Murdered by Leolf.

Edmund was unfortunately murdered in Gloceſter, by one Leolf a notorious robber. This man had been formerly ſentenced to baniſhment; yet had the boldneſs to enter the hall where the king himſelf dined, and to ſit at table with his attendants. Edmund immediately ordered him to leave the room. The villain refuſed to obey; upon which the king leaped upon him,

him, and ſeized him by the hair. Leolf then drew a dagger, and gave the king a wound, of which he inſtantly died, A. D. 946, being the ſixth year of his reign.

As the children of Edmund were too young at the time of his deceaſe, his brother Edred ſucceeded to the throne. The beginning of his reign, as well as thoſe of his predeceſſors, was diſturbed by the rebellions and incurſions of the Northumbrian Danes, who looked upon the ſucceſſion of every new king to be a favourable opportunity for ſhaking off the Engliſh yoke. On the appearance of Edred with an army, however, they immediately ſubmitted; but before the king withdrew his forces, he laid waſte their territories as a puniſhment for their offence. He was no ſooner gone, than they roſe in rebellion a ſecond time. They were again ſubdued; and the king took effectual precautions againſt their future revolts, by placing Engliſh garriſons in all their towns, and appointing an Engliſh governor to watch their motions, and ſuppreſs their inſurrections on the firſt appearance. In the reign of Edred, celibacy of the clergy began to be preached up under the patronage of St Dunstan. This man had obtained ſuch an aſcendant over Edred, who was naturally ſuperſtitious, that he not only directed him in affairs of conſcience, but in the moſt important matters of ſtate. He was placed at the head of the treaſury; and being thus poſſeſſed of great power at court, he was enabled to accompliſh the moſt arduous undertakings. He profeſſed himſelf a partiſan of the rigid monaſtic rules; and having introduced celibacy among the monks of Glaſtenbury and Abingdon, he endeavoured to render it univerſal among the clergy throughout the kingdom. The monks in a ſhort time generally embraced the pretended reformation; after which they inveighed bitterly againſt the vices and luxury of the age. When other topics of defamation were wanting, the marriages of clergymen became a ſure object of invective. Their wives received the appellation of *concubines* or ſome other more opprobrious name. The ſecular clergy, on the other hand, who were numerous and rich, defended themſelves with vigour, and endeavoured to retaliate upon their adverſaries. The people were thrown into the moſt violent ferments; but the monks, being patroniſed by king Edred, gained ground greatly upon their opponents. Their progreſs, however, was ſomewhat retarded by the king's death, which happened in 955, after a reign of nine years. He left children; but as they were infants, his nephew Edwy, ſon to Edmund, was placed on the throne.

The new king was not above 16 or 17 years of age at the time of his acceſſion. His reign is only remarkable for the tragical ſtory of his queen Elgiva. She was a princeſs of the royal blood, with whom Edwy was deeply enamoured. She was his ſecond or third couſin, and therefore within the degrees of affinity prohibited by the canon law. Edwy, however, hearkening only to the dictates of his paſſion, married her, contrary to the advice of the more dignified eccleſiaſtics. The monks on this occaſion were particularly violent; and therefore Edwy determined not to ſecond their ambitious projects. He ſoon found reaſon to repent his having provoked ſuch dangerous enemies. On his coronation day, while his nobility were indulging themſelves in riotous mirth in a great hall where they had aſſembled, Edwy withdrew to another apartment to enjoy the company of his beloved queen and her mother. Dunſtan gueſſed the reaſon of his abſence. With unparalleled impudence, he burſt into the queen's apartment; and upbraiding Edwy with his laſciviouſneſs, as he termed it, puſhed him back to the hall where the nobles were aſſembled. The king determined to reſent ſuch a daring inſult. He required from Dunſtan an account of his adminiſtration of the treaſury during the late reign. The monk, probably unable to give a juſt account, refuſed to give any; upon which Edwy accuſed him of malverſation in his office, and baniſhed him the kingdom.

This proved the worſt ſtep that could poſſibly have been taken. Dunſtan was no ſooner gone than the whole nation was in an uproar about his ſanctity and the king's impiety. Theſe clamours, as they had been begun by the clergy, ſo they were kept up and increaſed by them, till at laſt they proceeded to the moſt outrageous violence. Archbiſhop Odo ſent a party of ſoldiers to the palace. They ſeized the queen, and burned her face with a red-hot iron, in order to deſtroy her beauty by which ſhe had enticed her huſband; after which they carried her by force into Ireland, there to remain in perpetual exile. The king, finding it in vain to reſiſt, was obliged to conſent to a divorce from her, which was pronounced by Archbiſhop Odo. A cataſtrophe ſtill more diſmal awaited Elgiva. She had been cured of her wounds, and had even found means to efface the ſcars with which her perſecutors had hoped to deſtroy her beauty. She then came to England, with a deſign to return to the king, whom ſhe ſtill conſidered as her huſband. Unfortunately, however, ſhe was intercepted by a party of ſoldiers ſent for that purpoſe by the primate. Nothing but her moſt cruel death could now ſatisfy that wretch and his accomplices. She was hamſtringed at Glouceſter, and expired in a few days.

59
Tragical death of the queen.

The minds of the Engliſh were at this time ſo much ſunk in ſuperſtition, that the monſtrous inhumanity above mentioned was called a judgment from God upon Edwy and his ſpouſe for their diſſolute life, *i. e.* their love to each other. They even proceeded to rebellion againſt their ſovereign; and having raiſed to the throne Edgar, the younger brother of Edwy, at that time only 13 years of age, they ſoon put him in poſſeſſion of Mercia, Northumberland, and Eaſt Anglia. Edwy being thus confined to the ſouthern counties, Dunſtan returned, and took upon him the government of Edgar and his party; but the death of Edwy ſoon removed all difficulties, and gave Edgar peaceable poſſeſſion of the government.

60
Edgar.

The reign of Edgar proved one of the moſt fortunate mentioned in the ancient Engliſh hiſtory. He took the moſt effectual methods both for preventing tumults at home and invaſions from abroad. He quartered a body of diſciplined troops in the north, in order to repel the incurſions of the Scots, and to keep the Northumbrians in awe. He built a powerful navy; and that he might keep the ſeamen in the practice of their duty, as well as preſent a formidable armament to his enemies, he commanded the fleet from time to time, to make the circuit of his dominions.

61 His licentious amours

The greatneſs of king Edgar, which is very much celebrated by the Engliſh hiſtorians, was owing to the harmony which reigned between him and his ſubjects; and the reaſon of this good agreement was, that the king ſided with Dunſtan and the monks, who had acquired a great aſcendant over the people. He enabled them to accompliſh their favourite ſcheme of diſpoſſeſſing the ſecular canons of all the monaſteries; and he conſulted them not only in eccleſiaſtical, but alſo in civil affairs. On theſe accounts, he is celebrated by the monkiſh writers with the higheſt praiſes; though it is plain, from ſome of his actions, that he was a man who could be bound neither by the ties of religion nor humanity. He broke into a convent, and carried off by force, and raviſhed, a nun called *Editha*. His ſpiritual inſtructor, Dunſtan, for this offence, obliged the king, not to ſeparate from his miſtreſs, but to abſtain from wearing his crown for ſeven years!

Edgar, however, was not to be ſatisfied with one miſtreſs. He happened once to lodge at the houſe of a nobleman who had a very beautiful daughter. Edgar, enflamed with deſire at the ſight of the young lady, without ceremony aſked her mother to allow her to paſs a night with him. She promiſed compliance; but ſecretly ordered a waiting-maid, named *Elfleda*, to ſteal into the king's bed when the company were gone, and to retire before day-break. Edgar, however, detained her by force, till day-light diſcovered the deceit. His love was now transferred to the waiting-maid; who became his favourite miſtreſs, and maintained a great aſcendant over him till his marriage with Elfrida.

62 His marriage with Elfrida.

The circumſtances of this marriage were ſtill more ſingular and criminal than thoſe above mentioned. Elfrida was daughter and heireſs to Olgar Earl of Devonſhire. She was a perſon of ſuch exquiſite beauty, that her fame was ſpread all over England, though ſhe had never been at court. Edgar's curioſity was excited by the accounts he had heard of her, and therefore formed a deſign of marrying her. He communicated his intention to Earl Athelwold his favourite; and ordered him, on ſome pretence or other, to viſit the Earl of Devonſhire, and bring him a certain account concerning Elfrida. Athelwold went as he was deſired; but fell ſo deeply in love with the lady himſelf, that he reſolved to ſacrifice his fidelity to his paſſion. He returned to Edgar, and told him, that Elfrida's charms were by no means extraordinary, and would have been totally overlooked in a woman of inferior ſtation. After ſome time, however, turning the converſation again upon Elfrida, he told the king that he thought her parentage and fortune made her a very advantageous match; and therefore, if the king gave his conſent, he would make propoſals to the Earl of Devonſhire on his own behalf. Edgar conſented, and Athelwold was married to Elfrida.—After his marriage, he uſed his utmoſt endeavours to keep his wife from court, that Edgar might have no opportunity of obſerving her beauty. The king, however, was ſoon informed of the truth; and told Athelwold that he intended to pay him a viſit in his caſtle, and be made acquainted with his new-married wife. The Earl could make no objections; only he deſired a few hours to prepare for the viſit. He then confeſſed the whole to Elfrida, and begged of her to appear before the king as much to the diſadvantage as poſſible. Inſtead of this, ſhe dreſſed herſelf to the greateſt advantage. Edgar immediately conceived a violent paſſion for her; and, in order to gratify it, ſeduced Athelwold into a wood under pretence of hunting, where he ſtabbed him with his own hand, and afterwards married his widow.

63 Wolve tirpate from E land.

The reign of Edgar is remarkable among hiſtorians for the encouragement he gave to foreigners to reſide at his court and throughout the kingdom. Theſe foreigners, it is ſaid, corrupted the former ſimple manners of the nation. Of this ſimplicity, however, there ſeems to be no great reaſon to boaſt; ſeeing it could not preſerve them from treachery and cruelty, the greateſt of all vices: ſo that their acquaintance with foreigners was certainly an advantage to the people, as it tended to enlarge their views, and cure them of thoſe illiberal prejudices and ruſtic manners to which iſlanders are often ſubject.—Another remarkable incident, is the extirpation of wolves from England. The king took great pleaſure in hunting and deſtroying theſe animals himſelf. At laſt he found that they had all taken ſhelter in the mountains and foreſts of Wales. Upon this he changed the tribute impoſed upon the Welſh princes by Athelſtan, into an annual tribute of 300 wolves heads; and this produced ſuch diligence in hunting them, that the animal has never ſince appeared in England.

64 Edwar martyr

Edgar died in 957, after a reign of 16 years. He left a ſon named *Edward*, whom he had by his firſt wife the daughter of Earl Ordmer; and another, named *Ethelred*, by Elfrida. The mental qualifications of this lady were by no means anſwerable to the beauty of her perſon. She was ambitious, haughty, treacherous, and cruel. The principal nobility, therefore, were greatly averſe from the ſucceſſion of her ſon Ethelred, which would unavoidably throw too much power into the hands of his mother, as he himſelf was only ſeven years of age. Edward, afterwards ſurnamed the *Martyr*, was therefore pitched upon; and was certainly the moſt proper perſon, as he was 15 years of age, and might ſoon be able to take the government into his own hands. Elfrida oppoſed his advancement with all her might: but Dunſtan overcame every obſtacle, by anointing and crowning the young prince at Kingſton; upon which the whole kingdom ſubmitted without farther oppoſition.

65 Mirac St Du

The only remarkable occurrence in this reign was the complete victory gained by the monks over the ſecular clergy, who were now totally expelled from the convents. Though this had been pretty nearly accompliſhed by Edgar, the ſecular clergy ſtill had partiſans in England who made conſiderable oppoſition; but theſe were all ſilenced by the following miracles. In one ſynod, Dunſtan, finding the majority of votes againſt him, roſe up, and declared that he had that inſtant received from heaven a revelation in favour of the monks. The whole aſſembly was ſo much overawed by this intelligence, that they proceeded no farther in their deliberations. In another ſynod, a voice iſſued from the crucifix, acquainting the members, that the eſtabliſhment of the monks was founded on the will of heaven, and could not be oppoſed without impiety. But the third miracle was ſtill more alarming. In another

other ſynod the floor of the hall ſunk, and great numbers of the members were killed or bruiſed by their fall. It was remarked that Dunſtan had that day prevented the king from attending the ſynod, and that the beam on which his own chair ſtood was the only one which did not ſink. Theſe circumſtances, inſtead of making him ſuſpected as the author of the miracle, were regarded as proofs of the interpoſition of Providence in his favour.

Edward lived four years after he was raiſed to the throne, in perfect innocence and ſimplicity. Being incapable of any treacherous intention himſelf, he ſuſpected none in others. Though his ſtepmother had oppoſed his ſucceſſion, he had always behaved towards her with the greateſt reſpect; and expreſſed on all occaſions the moſt tender affection for his brother Ethelred. Being one day hunting in the neighbourhood of the caſtle where Elfrida reſided, he paid her a viſit unattended by any of his retinue. After mounting his horſe with a deſign to return, he deſired ſome liquor to be brought him. But while he was holding the cup to his head, a ſervant of Elfrida ſtabbed him behind. The king, finding himſelf wounded, clapped ſpurs to his horſe; but ſoon becoming faint by the loſs of blood, he fell from the ſaddle, and his foot being entangled in the ſtirrup, he was dragged along till he expired. His body was found and privately interred at Wereham by his ſervants. The Engliſh had ſuch compaſſion for this amiable prince, that they beſtowed on him the appellation of *Martyr*, and even fancied that miracles were wrought at his tomb. Elfrida built monaſteries, and ſubmitted to many penances, in order to atone for her guilt; but, even in that barbarous age, ſhe could never regain the good opinion of the public.

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After the murder of Edward, his brother Ethelred ſucceeded to the throne without oppoſition. As he was a minor when he was raiſed to the throne, and, even when he came to man's eſtate, never diſcovered any vigour or capacity of defending the kingdom againſt invaders, the Danes began to renew their incurſions. Before they durſt attempt any thing of importance, however, they firſt made a ſmall incurſion by way of trial. In the year 981, they landed in Southampton from ſeven veſſels; and having ravaged the country, they retired with impunity, carrying a great booty along with them. In 987, they made a ſimilar attempt on the weſt coaſt, and were attended with the like ſucceſs. Finding that matters were now in a favourable ſituation for their enterpriſes, they landed in Eſſex under the command of two chieftains; and, having defeated and killed Brithnot duke of that county, laid waſte all the neighbouring provinces. In this extremity, Ethelred, ſurnamed, on account of his prepoſterous conduct, the *Unready*, bribed the enemy with L.10,000 to depart the kingdom. This advice was given by Siricius archbiſhop of Canterbury, and ſome of the degenerate nobility; and was attended with the ſucceſs that might have been expected. The Danes appeared next year off the eaſtern coaſt. But, in the mean time, the Engliſh had determined to aſſemble at London a fleet capable of repulſing the enemy. This failed of ſucceſs through the treachery of Alfric Duke of Mercia. Having been formerly baniſhed the kingdom, and found great difficulty in getting himſelf reſtored to his former dignity, he truſted thenceforth, not to his ſervices or the affections of his countrymen, but to the influence he had over his vaſſals, and to the public calamities. Theſe laſt he determined always to promote as far as he could; becauſe in every revolution his aſſiſtance would be neceſſary, and conſequently he muſt receive a continual acceſſion of power. The Engliſh had formed a plan for ſurrounding and deſtroying the Daniſh fleet in the harbour; but Alfric not only gave the enemy notice of this deſign, but alſo deſerted with his ſquadron the night before the engagement. The Engliſh by this means proved unſucceſsful; and Ethelred, in revenge, took Alfgar, Alfric's ſon, and ordered his eyes to be put out. This piece of cruelty could be productive of no good effect. Alfric had become ſo powerful, that, notwithſtanding his treachery, it was found impoſſible to deprive him of the government of Mercia.

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In 993, the Danes under the command of Sweyn their king, and the Norwegians conducted by Olave king of that country, ſailed up the Humber, and deſtroyed all around them. A powerful army was aſſembled to oppoſe theſe invaders; but through the treachery of the three leaders, all men of Daniſh extraction, the Engliſh were totally defeated. Encouraged by this ſucceſs, the Danes entered the Thames in 94 veſſels, and laid ſiege to London. The inhabitants, however, made ſuch a brave defence, that the beſiegers were finally obliged to give over the attempt. Out of revenge for this diſappointment, they laid waſte Eſſex, Suſſex, and Hampſhire. In theſe counties they procured horſes; by which means they were enabled to penetrate into the more inland parts, and threatened the kingdom with total ſubjection. Ethelred and his nobles had now recourſe to their former expedient. They ſent ambaſſadors to the two northern kings, to whom they promiſed ſubſiſtence and tribute, provided they would, for the preſent, put an end to their ravages, and ſoon after depart the kingdom. They agreed to the terms, and peaceably took up their quarters at Southampton. Olave even paid a viſit to Ethelred, and received the rite of confirmation from the Engliſh biſhops. The king alſo made him many preſents; and Olave promiſed never more to infeſt the Engliſh territories; which promiſe it is ſaid he afterwards religiouſly obſerved.

After the departure of Olave with his Norwegians, Sweyn, though leſs ſcrupulous than the king of Norway, was obliged to leave the kingdom alſo. But this ſhameful compoſition procured only a ſhort relief to the nation. The Danes ſoon after appeared in the Severn; and having ravaged Wales as well as Cornwall and Devon, they ſailed round, and, entering the mouth of the Tamar, completed the ruin of theſe two counties. Then, returning to the Briſtol channel, and penetrating into the country by the Avon, they over-ran all that country, and carried fire and ſword even into Dorſetſhire. In 998, they changed the ſeat of war; and, after ravaging the iſle of Wight, they entered the Thames and Medway, where they laid ſiege to Rocheſter, and defeated the Kentiſh men in a great battle. After this victory, the whole province of Kent was made a ſcene of ſlaughter and devaſtation. The extremity of theſe miſeries forced the Engliſh into counſels for common defence both by ſea and land: but the weakneſs of the king, the diviſions among the nobility, the treachery of ſome, the cowardice of others, the

the want of concert in all, fruſtrated every endeavour; and their fleets and armies either came too late to attack the enemy, or were repulſed with diſhonour. The Engliſh, therefore, devoid both of prudence and unanimity in council, had recourſe to the expedient which by experience they had found to be ineffectual. They offered the Danes a large ſum if they would conclude a peace and depart the kingdom. Theſe ravagers continually roſe in their demands; and now required the payment of L.24,000, which the Engliſh ſubmitted to give. The departure of the Danes procured them a temporary relief; which they enjoyed as if it was to be perpetual, without making any effectual preparations for giving them a more vigorous reception upon their next return.

Beſides the receiving this ſum, the Danes were at preſent engaged by another motive to depart from England. They were invited over by their countrymen in Normandy, who at this time were hard preſſed by Robert king of France, and who found it difficult to defend their ſettlements againſt him. It is probable alſo, that Ethelred, obſerving the cloſe connection of all the Danes with one another, however they might be divided in government or ſituation, was deſirous of procuring an alliance with that formidable people. For this purpoſe, being at preſent a widower, he made his addreſſes to Emma, ſiſter to Richard II. Duke of Normandy. He ſoon ſucceeded in his negociations; the princeſs came over to England, and was married to the king in the year 1001.

69 Marriage of the king with the princeſs of Normandy.

Though the Danes had been for a long time eſtabliſhed in England, and though the ſimilarity of their language with the Saxon had invited them to an early coalition with the natives; they had as yet found ſo little example of civilized manners among the Engliſh, that they retained all their ancient ferocity, and valued themſelves only on their national character of military bravery. The Engliſh princes had been ſo well acquainted with their ſuperiority in this reſpect, that Athelſton and Edgar had been accuſtomed to keep in pay large bodies of Daniſh troops, who were quartered about the country, and committed many violences upon the inhabitants. Theſe mercenaries had attained to ſuch an height in luxury, according to the old Engliſh writers, that they combed their hair once a-day, bathed themſelves once a-week, changed their clothes frequently; and by all theſe arts of effeminacy, as well as by their military character, had rendered themſelves ſo agreeable to the fair ſex, that they debauched the wives and daughters of the Engliſh, and had diſhonoured many families. But what moſt provoked the inhabitants was, that, inſtead of defending them againſt invaders, they were always ready to betray them to the foreign Danes, and to aſſociate themſelves with every ſtraggling party which came from that nation.

70 Danes ſacred.

The animoſities between the native Engliſh and the Danes who inhabited among them, had from theſe cauſes riſen to a great height; when Ethelred, from a policy commonly adopted by weak princes, took the cruel reſolution of maſſacring the Danes throughout the kingdom. On the 13th of November 1002, ſecret orders were diſpatched to commence the execution every where on the ſame day; and the feſtival of St Brice, which fell on a Sunday, the day on which the Danes uſually bathed themſelves, was choſen for this purpoſe. Theſe cruel orders were executed with the utmoſt exactneſs. No diſtinction was made betwixt the innocent and the guilty; neither ſex nor age was ſpared; nor were the cruel executioners ſatisfied without the tortures, as well as death, of the unhappy victims. Even Gunilda, ſiſter to the king of Denmark, who had married Earl Paling, and had embraced Chriſtianity, was, by the advice of Edric Earl of Wilts, ſeized and condemned to death by Ethelred, after ſeeing her huſband and children butchered before her face. This unhappy princeſs foretold, in the agonies of deſpair, that her murder would ſoon be avenged by the total ruin of the Engliſh nation (A).

71 New ſion by Sweyn

The prophecy of Gunilda was exactly fulfilled. In 1003, Sweyn and his Danes, who wanted only a pretence to renew their invaſions, appeared off the weſtern coaſt, and threatened revenge for the ſlaughter of their countrymen. The Engliſh took meaſures for repulſing the enemy; but theſe were defeated thro' the treachery firſt of Alfric; and then of Edric, a ſtill greater traitor, who had married the king's daughter, and ſucceeded Alfric in the command of the Britiſh armies. The Danes therefore ravaged the whole country. Agriculture was neglected, a famine enſued, and the kingdom was reduced to the utmoſt degree of miſery. At laſt the infamous expedient of buying a peace was recurred to; and the departure of the Danes was purchaſed, in 1007, at the expence of L.30,000.

The Engliſh endeavoured to employ this interval in making preparations againſt the return of the Danes, which they had reaſon ſoon to expect. A law was made, ordering the proprietors of eight hides of land to provide themſelves of a horſeman and a complete ſuit of armour; and thoſe of 310 hides to equip a ſhip for the defence of the kingdom. By this means a formidable armament was raiſed. There were 243,600 hides in England; conſequently the ſhips equipped muſt be 785. The cavalry was 30,450 men. All hopes of ſucceſs from this equipment, however, were diſappointed by the factions, animoſities, and diſſentions

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(A) On the ſubject of this maſſacre, Mr Hume has the following obſervations: "Almoſt all the ancient hiſtorians ſpeak of this maſſacre of the Danes as if it had been univerſal, and as if every individual of that nation throughout England had been put to death. But the Danes were almoſt the ſole inhabitants in the kingdoms of Northumberland and Eaſt Anglia, and were very numerous in Mercia. This repreſentation of the matter was abſolutely impoſſible. Great reſiſtance muſt have been made, and violent wars enſued; which was not the caſe. This account given by Wallingford, though he ſtands ſingle, muſt be admitted as the only true one. We are told that the name of *lurdane, lord Dane,* for an idle lazy fellow who lives at other peoples expence, came from the conduct of the Danes who were put to death. But the Engliſh princes had been entirely maſters for ſeveral generations; and only ſupported a military corps of that nation. It ſeems probable, therefore, that theſe Danes only were put to death."

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tions of the nobility. Edric had cauſed his brother Brightric to advance an accuſation of treaſon againſt Wolfnoth governor of Suſſex, the father of the famous Earl Godwin; and that nobleman, knowing the power and malice of his enemy, conſulted his own ſafety by deſerting with 20 ſhips to the Danes. Brightric purſued him with a fleet of 80 ſail; but his ſhips being ſhattered in a tempeſt, and ſtranded on the coaſt, he was ſuddenly attacked by Wolfnoth, and all his veſſels were burnt or otherwiſe deſtroyed. The treachery of Edric fruſtrated every plan of future defence; and the whole navy was at laſt ſcattered into the ſeveral harbours.

By theſe fatal miſcarriages, the enemy had leiſure to over-run the whole kingdom. They had now got ſuch a footing, indeed, that they could hardly have been expelled though the nation had been ever ſo unanimous. But ſo far did mutual diffidence and diſſention prevail, that the governors of one province refuſed to march to the aſſiſtance of another; and were at laſt terrified from aſſembling their forces for the defence of their own. At laſt the uſual expedient was tried. A peace was bought with L.48,000; but this did not procure even the uſual temporary relief. The Danes, knowing that they were now maſters of the kingdom, took the money, and continued their devaſtations. They levied a new contribution of L 8000 on the county of Kent alone; murdered the archbiſhop of Canterbury, who had refuſed to countenance this exaction; and the Engliſh nobility ſubmitted every where to the Daniſh monarch, ſwearing allegiance to him, and giving hoſtages for their good behaviour. At laſt, Ethelred himſelf, dreading equally the violence of the enemy and the treachery of his own ſubjects, fled into Normandy, whither he had already ſent queen Emma and her two ſons Alfred and Edward. The Duke received his unhappy gueſts with a generoſity which does honour to his memory.

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The flight of king Ethelred happened in the end of the year 1013. He had not been above ſix weeks in Normandy, when he heard of the death of Sweyn, which happened at Gainſborough before he had time to eſtabliſh himſelf in his new dominions. At the ſame time he received an invitation from the prelates and nobility to reſume the kingdom; expreſſing alſo their hopes, that, being now better taught by experience, he would avoid theſe errors which had been ſo fatal to himſelf and his people. But the miſconduct of Ethelred was incurable; and, on his reſuming the government, he behaved in the very ſame manner that he had done before. His ſon-in-law Edric, notwithſtanding his repeated treaſons, retained ſuch influence at court, that he inſtilled into the king jealouſies of Sigefert and Morcar, two of the chief nobles of Mercia. Edric enticed them into his houſe, where he murdered them; while Ethelred partook of the infamy of this action, by confiſcating their eſtates, and confining the widow of Sigefert in a convent. She was a woman of ſingular beauty and merit; and in a viſit which was paid her, during her confinement, by prince Edmund the king's eldeſt ſon, ſhe inſpired him with ſo violent an affection, that he releaſed her from the convent, and ſoon after married her without his father's conſent.

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In the mean time, Canute, the ſon and ſucceſſor of Sweyn, proved an enemy no leſs terrible to the Engliſh than his father had been. He ravaged the eaſtern coaſt with mercileſs fury; and put aſhore all the Engliſh hoſtages at Sandwich, after having cut off their hands and noſes. He was at laſt obliged, by the neceſſity of his affairs, to return to Denmark. In a ſhort time, however, he returned, and continued his depredations along the ſouthern coaſt. He then broke into the counties of Dorſet, Wilts, and Somerſet; where an army was aſſembled againſt him under the command of Prince Edmund and Duke Edric. The latter ſtill continued his perfidious machinations; and after endeavouring in vain to get the prince into his power, found means to diſſipate the army, and then deſerted to Canute with 40 veſſels.

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Edmund was not diſheartened by this treachery. He again aſſembled his forces, and was in a condition to give the enemy battle. Ethelred, however, had now ſuch frequent experience of the treachery of his ſubjects, that he had loſt all confidence in them. He remained in London, pretending ſickneſs, but in reality from an apprehenſion that they intended to buy their peace by delivering him into the hands of his enemies. The army called aloud for their ſovereign to march at their head againſt the Danes; and on his refuſal to take the field, they were ſo diſcouraged, that all the preparations which had been made became ineffectual for the defence of the kingdom. Edmund, deprived of all regular reſources for the maintenance of the ſoldiers, was obliged to commit ſimilar ravages to thoſe practiſed by the Danes; and after making ſome fruitleſs expeditions into the north, which had ſubmitted entirely to Canute's power, he returned to London, where he found every thing in confuſion by the death of the king.

74
Edmund Ironſide divides the kingdom with the Danes.

Ethelred died in 1016, after an unhappy reign of 35 years; and was ſucceeded by his eldeſt ſon Edmund, ſurnamed *Ironſide* on account of his great ſtrength and valour. He poſſeſſed abilities ſufficient to have ſaved his country from ruin, had he come ſooner to the throne; but it was now too late. He bravely oppoſed the Danes, however, notwithſtanding every diſadvantage; till it laſt the nobility of both nations obliged their kings to come to a compromiſe, and divide the kingdom between them by treaty. Canute reſerved to himſelf Mercia, Eaſt Anglia, and Northumberland, which he had entirely ſubdued. The ſouthern parts were left to Edmund. This prince ſurvived the treaty only about a month; being murdered at Oxford by two of his chamberlains, accomplices of Edric.

75
Canute.

After the death of Edmund, nothing was left for the Engliſh but ſubmiſſion to Canute. The leaſt ſcrupulous of mankind, however, dare not at all times openly commit injuſtice. Canute, therefore, before he ſeized the dominions of Edwin and Edward, the two ſons of Edmund, ſuborned ſome of the nobility to depoſe, that, in the laſt treaty with Edmund, it had been verbally agreed, that, in caſe of Edmund's death, Canute ſhould either be ſucceſſor to his dominions, or tutor to his children; for hiſtorians differ with regard to this particular. This evidence, ſupported by the great power of Canute, was ſufficient to get him elected king of England. Immediately after his acceſſion to the throne, he ſent the two ſons of Edmund to the court of Sweden, on pretence of being there educated;

but charged the king to put them to death as ſoon as they arrived. The Swediſh monarch did not comply with this requeſt; but ſent them to Solomon king of Hungary, to be educated in his court. The elder, Edwin, was afterwards married to Solomon's ſiſter: but he dying without iſſue, that prince gave his ſiſter-in-law, Agatha, daughter of the emperor Henry II. in marriage to Edward, the younger brother; and ſhe bore him Edgar Atheling; Margaret, afterwards queen of Scotland; and Chriſtina, who retired into a convent.

76 Marries Ethelred's widow.

Canute was obliged at firſt to make great conceſſions to the nobility: but he afterwards put to death many of thoſe in whom he could not put confidence; and, among the reſt, the traitor Edric himſelf, who was publicly executed, and his body thrown into the Thames. In order to prevent any danger from the Normans, who had threatened him with an invaſion, he married Emma the widow of Ethelred, and who now came over from Normandy; promiſing that he would leave the children he ſhould have by that marriage heirs to the crown after his deceaſe. The Engliſh were at firſt diſpleaſed with Emma for marrying the mortal enemy of her former huſband; but at the ſame time were glad to find at court a ſovereign to whom they were accuſtomed, and who had already formed connections with them: and thus Canute, beſides ſecuring by his marriage the alliance with Normandy, gradually acquired by the ſame means the confidence of his own people.

The moſt remarkable tranſaction in this prince's reign, beſides thoſe mentioned under the article Canute, is his expedition to Scotland againſt Malcolm king of that country, whom he forced to do homage for the county of Cumberland, which the Scots at that time poſſeſſed. After this enterpriſe, Canute paſſed four years in peace, and died at Shaftſbury; leaving three ſons, Sweyn, Harold, and Hardicanute. Sweyn, whom he had by his firſt marriage with Alfwen, daughter of the earl of Hampſhire, was crowned in Norway; Hardicanute, whom Emma had born, was in poſſeſſion of Denmark; and Harold, who was of the ſame marriage with Sweyn, was at that time in England.

77 Harold.

78 His treachery and cruelty.

Harold ſucceeded to the crown of England; though it had been ſtipulated that Emma's ſon, Hardicanute, ſhould be heir to that kingdom. This advantage Harold obtained by being on the ſpot, and getting poſſeſſion of his father's treaſures, while Hardicanute was at a diſtance. As Hardicanute, however, was ſupported by earl Godwin, a civil war was likely to enſue, when a compromiſe was made; by which it was agreed, that Harold ſhould enjoy London, and all the provinces north of the Thames, while the poſſeſſion of the ſouth ſhould remain to Hardicanute: and till that prince ſhould appear and take poſſeſſion of his dominions, Emma fixed her reſidence at Wincheſter, and ruled her ſon's part. Harold reigned four years; during which time, the only memorable action he performed was a moſt infamous piece of treachery.—Alfred and Edward, the two ſons of Emma by Ethelred, paid a viſit to their mother in England. But, in the mean time, earl Godwin being gained over by Harold, a plan was laid for the deſtruction of the two princes. Alfred was accordingly invited to London by Harold, with many profeſſions of friendſhip; but when he had reached Guildford, he was ſet upon by Godwin's vaſſals. about 600 of his train were murdered in the moſt cruel manner; he himſelf was taken priſoner, his eyes were put out, and he was conducted to the monaſtery of Ely, where he died ſoon after. Edward and Emma, appriſed of the fate which awaited them, fled beyond ſea, the former into Normandy, the latter into Flanders; while Harold took poſſeſſion of all his brother's dominions without oppoſition.—He died in April 1039.

7 Edwar Confe

Hardicanute ſucceeded his brother Harold without oppoſition. His government was extremely violent and tyrannical. However, it was but of ſhort duration. He died, in 1041, of a debauch at the marriage of a Daniſh lord. After his death, a favourable opportunity was offered to the Engliſh for ſhaking off the Daniſh yoke. Sweyn, king of Norway, the eldeſt ſon of Canute, was abſent; and as the two laſt kings had died without iſſue, there appeared none of that race whom the Danes could ſupport as ſucceſſor to the throne. For this reaſon, the eyes of the nation were naturally drawn towards prince Edward, who happened to be at court when the king died. There were ſome reaſons, however, to fear, that Edward's ſucceſſion would be oppoſed by earl Godwin, who was by far the moſt powerful nobleman in the kingdom. A declared animoſity ſubſiſted between Edward and Godwin, on account of the hand which the latter had in the murder of his brother Alfred; and this was thought to be an offence of ſo grievous a nature, that Edward could never forgive it. But here their common friends interpoſed; and repreſenting the neceſſity of their good correſpondence, obliged them to lay aſide their animoſities, and to concur in reſtoring liberty to their native country. Godwin only ſtipulated that Edward, as a pledge of his ſincere reconciliation, ſhould promiſe to marry his daughter Editha. This propoſal was agreed to; Edward was crowned king of England, and married Editha as he had promiſed. The marriage, however, proved rather a ſource of diſcord than otherwiſe between the king and Godwin. Editha, though a very amiable woman, could never obtain the confidence and affection of her huſband. It is even ſaid, that, during the whole courſe of her life, he abſtained from all matrimonial converſe with her; and this ridiculous behaviour was highly celebrated by the monkiſh writers of the age, and contributed to the king's acquiring the title of Saint and Confeſſor.

8 Varian the kin and ea Godwi

Though the neglect of his daughter could not fail to awaken Godwin's former enmity againſt king Edward, it was neceſſary to chooſe a more popular ground before he could vent his complaints againſt the king in a public manner. He therefore choſe for his theme the influence which the Normans had on the affairs of government; and a declared oppoſition took place between him and theſe favourites. In a ſhort time, this animoſity openly broke out with great violence. Euſtace count of Bologne having paid a viſit to the king, paſſed by Dover on his return. One of his train being refuſed acceſs to a lodging which had been appointed for him, attempted to make his way by force, and wounded the maſter of the houſe in the conteſt. The townſmen revenged this inſult by the death of the ſtranger; the count and his train took arms, and mur-

murdered the townſman in his own houſe. A tumult enſued; near 20 perſons were killed on each ſide; and Euſtace being overpowered with numbers, was at laſt obliged to fly. He complained to the king; who gave orders to earl Godwin, in whoſe government Dover lay, to puniſh the inhabitants. But this nobleman refuſed to obey the command, and endeavoured to throw the whole blame on count Euſtace and his followers. The king was diſpleaſed; and threatened to make him feel the utmoſt effects of his reſentment, in caſe he finally refuſed to comply. Upon this, Godwin aſſembled a powerful army, on pretence of repreſſing ſome diſorders on the frontiers of Wales; but, inſtead of this, marched directly to Gloceſter, where the king at that time was without any military force, as ſuſpecting no danger.

81
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Edward perceiving his danger, applied to Siward duke of Northumberland, and Leofric duke of Mercia, two very powerful noblemen. They haſtened to him with ſuch followers as they could aſſemble, iſſuing orders at the ſame time for all the forces under their reſpective governments to march without delay to the defence of the king. Godwin, in the mean time, ſuffered himſelf to be deceived by negociations, till the king's army became ſo powerful, that he was not able to cope with it. He was therefore obliged to fly with his family to Flanders. Here he was protected by Baldwin earl of that country, together with his three ſons Gurth, Sweyn, and Toſti; the laſt of whom had married Baldwin's daughter. Harold and Leofwin, two other ſons of Godwin, took ſhelter in Ireland.

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After the flight of earl Godwin, he was proceeded againſt as a traitor by king Edward. His eſtates, and thoſe of his ſons, were confiſcated; his governments given to others; queen Editha was confined in a monaſtery; and the great power of this family, which had become formidable to the crown itſelf, ſeemed to be totally overthrown. Godwin, however, ſoon found means to retrieve his affairs. Having hired ſome ſhips, and manned them with his followers, he attempted to make a deſcent at Sandwich. The king, informed of his preparations, equipped a fleet which Godwin could not reſiſt, and he therefore retreated into the Flemiſh harbours. On his departure, the Engliſh diſmiſſed their armament. This Godwin had expected, and therefore kept himſelf in readineſs for the favourable opportunity. He immediately put to ſea, and ſailed to the Iſle of Wight, where he was joined by Harold with a ſquadron which he had collected in Ireland. Being thus maſter of the ſea, Godwin entered the harbours on the ſouthern coaſt; ſeized all the ſhips; and being joined by great numbers of his former vaſſals, he ſailed up the Thames, and appeared before London.

The approach of ſuch a formidable enemy threw every thing into confuſion. The king alone ſeemed reſolute to defend himſelf to the laſt extremity; but the interpoſition of many of the nobility, together with the ſubmiſſions of Godwin himſelf, at laſt produced an accommodation. It was ſtipulated, that Godwin ſhould give hoſtages for his good behaviour, and that all the foreigners ſhould be baniſhed the kingdom; after which, Edward, ſenſible that he had not power ſufficient to detain the earl's hoſtages in England, ſent them over to his kinſman the young duke of Normandy.

83
His ſon Harold aſpires to the crown.

Soon after this reconciliation, Godwin died as he was ſitting at table with the king. He was ſucceeded in the government of Weſſex, Suſſex, Kent, and Eſſex, and in the office of ſteward of the houſehold, a place of great power, by his ſon Harold. The ſon was no leſs ambitious than his father had been; and as he was a man of much greater abilities, he became a more dangerous enemy to Edward than even Godwin had been. Edward knew no better expedient to prevent the increaſe of Harold's power, than by giving him a rival. This was Algar ſon of Leofric duke of Mercia, whom he inveſted with the government of Eaſt Anglia, which had formerly belonged to Harold. The latter, however, after ſome broils, finally got the better of his rival, and baniſhed him the kingdom. Algar returned ſoon after with an army of Norwegians, with whom he invaded Eaſt Anglia; but his death in a ſhort time freed Harold from all further apprehenſions from that quarter. His power was ſtill further increaſed in a ſhort time after by the acceſſion of his brother Toſti to the government of Northumberland; and Edward now declining in years, and apprehenſive that Harold would attempt to uſurp the crown after his death, reſolved to appoint a ſucceſſor. He therefore ſent a deputation into Hungary, to invite over his nephew, Edward, ſon to his elder brother, who was the only remaining heir of the Saxon line. That prince accordingly came over with his children, Edgar Atheling, Margaret, and Chriſtina; but died a few days after his arrival. His death threw the king into greater perplexity than ever. Being reſolved to exclude Harold if poſſible, he ſecretly caſt his eye on his kinſman William duke of Normandy; a perſon of whoſe power, character, and capacity, he had juſtly a very high opinion. This advice had formerly been given him by Robert archbiſhop of Canterbury, who was himſelf a Norman, and had been baniſhed along with the reſt upon the return of earl Godwin. But Edward finding that the Engliſh would more eaſily acquieſce in the reſtoration of the Saxon line, had in the mean time invited his brother's deſcendants from Hungary as already mentioned. The death of his nephew, and the inexperience and unpromiſing qualities of young Edgar, made him reſume his former intentions in favour of the duke of Normandy, though his averſion to hazardous enterpriſes engaged him to poſtpone the execution, and even to keep his purpoſe concealed from all his miniſters.

Harold in the mean time increaſed his popularity by all poſſible means, in order to prepare his way for being advanced to the throne after the death of Edward, which now ſeemed to be faſt approaching. He had no ſuſpicion of the duke of Normandy as a rival; but as he knew that a ſon and grandſon of the earl Godwin were in the hands of that prince as hoſtages, he feared that they might be made uſe of as checks upon his ambition, in caſe he attempted afterwards to aſcend the throne. He therefore prevailed upon Edward to releaſe theſe hoſtages unconditionally; and having obtained his conſent, he ſet out for Normandy himſelf, attended by a numerous retinue. He was driven by a tempeſt on the territory of Guy count of

England.

Ponthieu, who detained him priſoner, and demanded an exorbitant ſum for his ranſom. Harold found means to acquaint William with his ſituation. The duke of Normandy, deſirous of gaining Harold over to his party, commanded Guy to reſtore his priſoner to his liberty. Upon this Harold was immediately put into the hands of the Norman ambaſſador, who conducted him to Rouen. William received him with great demonſtrations of reſpect and friendſhip; but ſoon took an opportunity of acquainting him with his pretenſions to the crown of England, and aſked his aſſiſtance in the execution of his ſcheme. Harold was ſurpriſed with this declaration of the duke; but being entirely in his power, he feigned a compliance with his deſires, and promiſed to ſecond to the utmoſt of his ability the will of king Edward. William, to ſecure him as much as poſſible to his intereſt, promiſed him his daughter in marriage, and required him to take an oath that he would fulfil his promiſes. Harold readily complied; but to make the oath more binding, William privately conveyed under the altar where the oath was taken, reliques of ſome of the moſt revered martyrs; and when Harold had taken the oath, he ſhowed him the relics, and admoniſhed him to obſerve religiouſly ſuch a ſolemn engagement.

Harold was no ſooner at liberty, than he found himſelf maſter of caſuiſtry ſufficient to excuſe the breaking of his oath, which had been extorted from him, and which, if kept, might be attended with the ſubjection of his country to a foreign power. He continued to practiſe every art to increaſe his popularity; and about this time, two accidents enabled him to add much to that character which he had already ſo well eſtabliſhed. The Welſh had for ſome time made incurſions into the Engliſh territories, and had lately become ſo troubleſome, that Harold thought he could not do a more acceptable piece of ſervice to the public, than undertake an expedition againſt theſe invaders. Having therefore prepared ſome light-armed foot to purſue the natives into their fortreſſes, ſome cavalry to ſecure the open country, and a ſquadron of ſhips to attack the ſea-coaſts, he employed all theſe forces againſt the enemy at once; and thus reduced them to ſuch diſtreſs, that they were obliged to purchaſe peace by ſending their prince's head to Harold, and ſubmitting to the government of two Welſh noblemen appointed by Edward.

The other incident was no leſs honourable to Harold. Toſti his brother had been created duke of Northumberland; but being of a violent tyrannical temper, had treated the inhabitants with ſuch cruelty, that they roſe in rebellion againſt him, and drove him from his government. Morcar and Edwin, two brothers, grandſons of the great duke Leofric, joined in the inſurrection; and the former being elected duke, advanced with an army to oppoſe Harold, who had been commiſſioned by the king to reduce and puniſh the Northumbrians. Before the armies engaged, Morcar endeavoured to juſtify his conduct, and repreſented to Harold, that Toſti had behaved in ſuch a manner, that no one, not even a brother, could defend him without participating of the infamy of his conduct: that the Northumbrians were willing to ſubmit to the king, but required a governor that would pay ſome attention to their privileges; and they truſted that Harold would not defend in another that violent conduct from which his own government had always kept at ſo great a diſtance. This ſpeech was accompanied by ſuch a detail of well ſupported facts, that Harold abandoned his brother's cauſe; and returning to Edward, perſuaded him to pardon the Northumbrians, and confirm Morcar in his government. He even married the ſiſter of that nobleman; and by his intereſt procured Edwin the younger brother to be choſen governor of Mercia. Toſti, in a rage, departed the kingdom, and took ſhelter in Flanders with Baldwin his father-in-law; while William of Normandy ſaw that now he had nothing to expect from Harold, who plainly intended to ſecure the crown for himſelf.

81
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Edward died in 1067, and was ſucceeded by Harold with as little oppoſition as though he had been the lawful heir. The very day after Edward's death, he was anointed and crowned by the archbiſhop of York. The whole nation ſeemed joyfully to ſwear allegiance to him. But he did not long enjoy the crown, to obtain which he had taken ſo much pains, and which he ſeemed to have ſuch capacity for wearing. His brother Toſti, provoked at his ſucceſs, ſtirred up againſt him every enemy he could have any influence with. The duke of Normandy alſo was enraged to the laſt degree at the perfidy of Harold; but before he commenced hoſtilities, he ſent an embaſſy to England, upbraiding the king with his breach of faith, and ſummoning him to reſign the kingdom immediately. Harold replied, that the oath, with which he was reproached, had been extorted by the well-grounded fear of violence, and for that reaſon could never be regarded as obligatory: that he never had any commiſſion either from the late king or the ſtates of England, who alone could diſpoſe of the crown, to make any tender of the ſucceſſion to the duke of Normandy; and if he, a private perſon, had aſſumed ſo much authority, and had even voluntarily ſworn to ſupport the Duke's pretenſions, the oath was unlawful, and it was his duty to take the firſt opportunity of breaking it: that he had obtained the crown by the unanimous ſuffrages of the people; and ſhould ſhow himſelf totally unworthy of their favour, did he not ſtrenuouſly maintain thoſe liberties with which they had entruſted him; and that the Duke, if he made any attempt by force of arms, ſhould experience the power of an united nation, conducted by a prince, who, ſenſible of the obligations impoſed on him by his royal dignity, was determined, that the ſame moment ſhould put a period to his life and to his government.

This anſwer was according to William's expectations; and therefore he had already made preparations for invading England. He was encouraged and aſſiſted in this enterpriſe by Howel count of Brittany, Baldwin earl of Flanders, the emperor Henry IV. and pope Alexander II. The latter declared Harold a perjured uſurper; denounced excommunication againſt him and his adherents; and the more to encourage William in his enterpriſes, ſent him a conſecrated banner, and a ring with one of St Peter's hairs in it. Thus he was enabled to aſſemble a fleet of 3000 veſſels, on board of which were embarked 60,000 men, choſen from among thoſe numerous ſupplies which were ſent him from all quarters. Many eminent perſonages were enliſted under

der his banners. The moſt celebrated were Euſtace count of Boulogne, Aimeri de Thouars, Hugh d'Eſtaples, William d'Evreux, Geoffroy de Rotrou, Roger de Beaumont, William de Warenne, Roger de Montgomeri, Hugh de Grantmeſnil, Charles Martel, and Geoffroy Giffard.

In order to embarraſs the affairs of Harold the more effectually, William alſo excited Toſti, in concert with Halfager king of Norway, to infeſt the Engliſh coaſts. Theſe two having collected a fleet of 350 ſhips, ſailed up the Humber, and diſembarked their troops, who began to commit great depredations. They were oppoſed by Morcar earl or duke (B) of Northumberland, and Edwin earl of Mercia, who were defeated. Harold, on the news of this invaſion, aſſembled a conſiderable army, engaged the enemy at Standford, and after a bloody battle entirely defeated them. Toſti and Halfager were killed in the action, and all the fleet fell into the hands of the victors; but Harold generouſly allowed Olave the ſon of Halfager to depart with 20 veſſels.

The king of England had ſcarce time to rejoice on account of his victory, when news were brought him that the Normans were landed in Suſſex. Harold's victory had conſiderably weakened his army. He loſt many of his braveſt officers and ſoldiers in the action; and he diſguſted the reſt, by refuſing to diſtribute the Daniſh ſpoils among them. He haſtened, however, by quick marches, to repel this new invader; but though he was reinforced at London and other places with freſh troops, he found himſelf weakened by the deſertion of his old ſoldiers, who, from fatigue and diſcontent, ſecretly withdrew from their colours. Gurth, the brother of Harold, a man of great conduct as well as bravery, became apprehenſive of the event; and entreated the king to avoid a general engagement for ſome time, or at leaſt not to hazard his perſon But though this advice was in itſelf evidently proper, and enforced by all the arguments which Gurth could ſuggeſt, Harold continued deaf to every thing that could be ſaid. Accordingly, on the 14th of October 1066, the two armies engaged near Haſtings, a town of Suſſex. After a moſt obſtinate and bloody battle *, the Engliſh were entirely defeated, Harold and his two brothers killed, and William left maſter of the kingdom of England.

Nothing could exceed the terror of the Engliſh upon the news of the defeat and death of Harold. As ſoon as William paſſed the Thames at Wallingford, Stigand, the primate, made ſubmiſſions to him in the name of the clergy; and before he came within ſight of London, all the chief nobility, and even Edgar Atheling himſelf, who, being the rightful heir to the throne, had juſt before been declared king, came and ſubmitted to the conqueror. William very readily accepted of the crown upon the terms that were offered him; which were, that he ſhould govern according to the eſtabliſhed cuſtoms of the country. He could indeed have made what terms he pleaſed; but, though really a conqueror, he choſe rather to be thought an elected king. For this reaſon he was crowned at Weſtminſter by the archbiſhop of York, and took the oath adminiſtered to the former kings of England; namely, that he would protect and defend the church, obſerve the laws of the realm, and govern the kingdom with impartiality.

88
The Engliſh grievouſly oppreſſed.

The Engliſh hiſtorians complain of the moſt grievous oppreſſion by William and his Normans. Whether by his conduct the conqueror willingly gave the Engliſh opportunities of rebelling againſt him, in order to have a pretence for oppreſſing them afterwards, is not eaſy to ſay; but it is certain that the beginning of his reign cannot juſtly be blamed. The firſt diſguſt againſt his government was excited among the clergy. William could not avoid the rewarding of thoſe numerous adventurers who had accompanied him in his expedition. He firſt divided the lands of the Engliſh barons who had oppoſed him among his Norman barons; but as theſe were found inſufficient, he quartered the reſt on the rich abbeys, of which there were many in the kingdom, until ſome other opportunity of providing for them offered itſelf.

Though this laſt ſtep was highly reſented by the clergy, it gave very little offence to the laity. The whole nation, however, was ſoon after diſguſted, by ſeeing all the real power of the kingdom placed in the hands of the Normans. He diſarmed the city of London, and other places which appeared moſt warlike and populous, and quartered Norman ſoldiers wherever he dreaded an inſurrection. This was indeed acting as a conqueror, and not as an elected king; but the event ſhowed the neceſſity of ſuch precautions. The king having thus ſecured, as he imagined, England from any danger of a revolt, determined to pay a viſit to his Norman dominions. He appointed his brother Odo, biſhop of Bayeaux, and William Fitz-Oſborne, regents in his abſence; and to ſecure himſelf yet farther, he reſolved to carry along with him ſuch of the Engliſh nobility as he put the leaſt confidence in.

Having taken all theſe methods to enſure the tranquillity of his new kingdom, William ſet ſail for Normandy in March 1067; but his abſence produced the moſt fatal conſequences. Diſcontents and murmurings were multiplied everywhere; ſecret conſpiracies were entered into againſt the government; hoſtilities were commenced in many places; and every thing ſeemed to threaten a ſpeedy revolution. William of Poictiers, a Norman hiſtorian, throws the blame entirely on the Engliſh. He calls them a fickle and mutinous race, while he celebrates with the higheſt encomiums the juſtice and lenity of Odo's and Fitz-Oſborne's adminiſtration. On the other hand, the Engliſh hiſtorians tell us, that theſe governors took all opportunities of oppreſſing the people, either with a view to provoke them to rebellion, or in caſe they tamely ſubmitted to their impoſitions, to grow rich by plundering them. Be this as it will, however, a ſecret conſpiracy was formed among the Engliſh for a general maſſacre of the Normans, like what had formerly been made of the Danes. This was proſecuted with ſo much animoſity, that the vaſſals of the earl of Coxo put him to death becauſe he refuſed to head them in the enterpriſe. The conſpirators had already taken the reſolution, and fixed the day for their intended maſſacre, which was to be on Aſh-Wedneſday, during the time of divine ſervice,

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(B) Anciently theſe two titles were ſynonymous.

vice, when all the Normans would be unarmed as penitents, according to the diſcipline of the times. But the preſence of William diſconcerted all their ſchemes. Having got intelligence of their bloody purpoſe, he haſtened over to England. Such of the conſpirators as had been more open in their rebellion, conſulted their ſafety by flight; and this ſerved to confirm the proofs of an accuſation againſt thoſe who remained. From this time the king not only loſt all confidence in his Engliſh ſubjects, but regarded them as inveterate and irreconcileable enemies. He had already raiſed ſuch a number of fortreſſes in the country, that he no longer dreaded the tumultuous or tranſient efforts of a diſcontented multitude. He determined therefore to treat them as a conquered nation. The firſt inſtance of this treatment was his revival of the tax of Danegelt, which had been impoſed by the Daniſh conquerors, and was very odious to the people. This produced great diſcontents, and even inſurrections. The inhabitants of Exeter and Cornwal revolted; but were ſoon reduced, and obliged to implore the mercy of the conqueror. A more dangerous rebellion happened in the north; but this was alſo ſoon quaſhed, and the Engliſh became ſenſible that their deſtruction was intended. Their eaſy ſubmiſſion after the battle of Haſtings had inſpired the Normans with contempt; their commotions afterwards had rendered them objects of hatred; and they were now deprived of every expedient which could make them either regarded or beloved by their ſovereign. Many fled into foreign countries; and among the reſt Edgar Atheling himſelf, who made his eſcape to Scotland, and carried thither his two ſiſters Margaret and Chriſtina. They were well received by Malcolm, who ſoon after married Margaret the elder ſiſter, and alſo received great numbers of other exiles with the utmoſt kindneſs.

The Engliſh, though unable to make any reſiſtance openly, did not fail to gratify their reſentment againſt the Normans in a private manner. Seldom a day paſſed, but the bodies of aſſaſſinated Normans were found in the woods and high-ways, without any poſſibility of bringing the perpetrators to juſtice. Thus, at length, the conquerors themſelves began again to wiſh for tranquillity and ſecurity; and ſeveral of them, though entruſted with great commands, deſired to be diſmiſſed the ſervice. In order to prevent theſe deſertions, which William highly reſented, he was obliged to allure others to ſtay by the largeneſs of his bounties. The conſequences were, freſh exactions from the Engliſh, and new inſurrections on their part againſt their cruel maſters. The Norman power, however, was too well founded to be now removed, and every attempt of the Engliſh to regain their liberty ſerved only to rivet their chains the more firmly. The county of Northumberland, which had been moſt active in theſe inſurrections, now ſuffered moſt ſeverely. The whole of it was laid waſte, the houſes were burned, the inſtruments of agriculture deſtroyed, and the inhabitants forced to ſeek new places of abode. On this occaſion it is ſaid that above 100,000 perſons periſhed either by the ſword or famine; and the country is ſuppoſed, even to this day, to retain the marks of its ancient depopulation. The eſtates of all the Engliſh gentry were next confiſcated, and beſtowed on the Normans. By this means all the ancient and honourable families were reduced to beggary; and the Engliſh found themſelves totally excluded from every road that led either to honour or preferment.

8
Diſſ-n
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By proceeding in this manner, William at laſt broke the ſpirit of the Engliſh nation, and received no farther trouble from them. In 1076, however, he found that the latter part of his life was likely to be unhappy through diſſenſions in his own family. He had four ſons, Robert, Richard, William, and Henry, beſides ſeveral daughters. Robert, his eldeſt ſon, ſurnamed *Curthoſe*, from the ſhortneſs of his legs, was a prince who inherited all the bravery and ambition of his family. He had formerly been promiſed by his father the government of the province of Maine in France, and was alſo declared ſucceſſor to the dukedom of Normandy. He demanded from his father the fulfilment of theſe promiſes; but William gave him a flat denial, obſerving, that "it was not his cuſtom to throw off his clothes till he went to bed." Robert declared his reſentment; and openly expreſſed his jealouſy of his two brothers William and Henry, (for Richard was killed, in hunting, by a ſtag). An open rupture was ſoon commenced. The two young princes one day took it into their heads to throw water on their elder brother as he paſſed through the court after leaving their apartment. Robert conſtrued this frolic into a ſtudied indignity; and having theſe jealouſies ſtill farther inflamed by one of his favourites, he drew his ſword, and ran up ſtairs with an intent to take revenge. The whole caſtle was quickly filled with tumult, and it was not without ſome difficulty that the king himſelf was able to appeaſe it. But he could not allay the animoſity which from that moment prevailed in his family. Robert, attended by ſeveral of his confederates, withdrew to Rouen that very night, hoping to ſurpriſe the caſtle; but his deſign was defeated by the governor. The popular character of the prince, however, engaged all the young nobility of Normandy, as well as of Anjou and Brittany, to eſpouſe his quarrel; even his mother is ſuppoſed to have ſupported him in his rebellion by ſecret remittances. The unnatural conteſt continued for ſeveral years; and William was at laſt obliged to have recourſe to England for ſupport againſt his own ſon. Accordingly, he drew an army of Engliſhmen together; he led them over to Normandy, where he ſoon compelled Robert and his adherents to quit the field, and was quickly reinſtated in all his dominions. Robert then took ſhelter in the caſtle of Gerberoy, which the king of France had provided for him, where he was ſhortly after beſieged by his father. As the garriſon was ſtrong, and conſcious of their treaſon, they made a gallant defence; and many ſkirmiſhes and duels were fought under its walls. In one of theſe the king and his ſon happened to meet; but being both concealed by their helmets, they attacked each other with mutual fury. The young prince wounded his father in the arm, and threw him from his horſe. The next blow would probably have put an end to his life, had he not called for aſſiſtance. Robert inſtantly recollected his father's voice, leaped from his horſe, and raiſed him from the ground. He proſtrated himſelf in his preſence, aſked pardon for his offences, and promiſed for the future a ſtrict adherence to his duty. The king was not ſo eaſily appeaſed; and perhaps his reſentment was heightened

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by the diſgrace of being overcome. He therefore gave his malediction to his ſon; and returned to his own camp on Robert's horſe, which he had aſſiſted him to mount. After ſome recollection, however, he was reconciled to Robert, and carried him with him into England.

William returned in 1081; and being now freed from his enemies both at home and abroad, began to have more leiſure to attend to his own domeſtic affairs. For this purpoſe the *Doomsday-Book* was compoſed by his order, of which an account is given under that article. He reſerved a very ample revenue for the crown; and in the general diſtribution of land among his followers, kept poſſeſſion of no fewer than 1400 manors in different parts of the country. No king of England was ever ſo opulent; none was able to ſupport the ſplendor and magnificence of a court to ſuch a degree; none had ſo many places of truſt and profit to beſtow; and conſequently none ever had ſuch implicit obedience paid to his commands. He delighted greatly in hunting; and to indulge himſelf in this with the greater freedom, he depopulated the county of Hampſhire for 30 miles, turning out the inhabitants, deſtroying all the villages, and making the wretched outcaſts no compenſation for ſuch an injury. In the time of the Saxon kings, all noblemen without diſtinction had a right to hunt in the royal foreſts; but William appropriated all theſe to himſelf, and publiſhed very ſevere laws to prohibit his ſubjects from encroaching on this part of his prerogative. The killing of a boar, a deer, or even an hare, was puniſhed with the loſs of the delinquent's eyes; at the time when the killing of a man might be atoned for by paying a moderate fine or compoſition.

As the king's wealth and power were ſo great, it may reaſonably be ſuppoſed, that the riches of his miniſters were in proportion. Odo, biſhop of Bayeux, William's brother, was become ſo rich, that he reſolved to purchaſe the papacy. For this purpoſe, taking the opportunity of the king's abſence, he equipped a veſſel in the Iſle of Wight, on board of which he ſent immenſe treaſures, and prepared for his embarkation. He was detained, however, by contrary winds; and, in the mean time, William, being informed of his deſigns, reſolved to prevent the exportation of ſo much wealth from his dominions. Returning therefore from Normandy, where he was at that time, he came to England the very inſtant his brother was ſtepping on board. He immediately ordered him to be made priſoner: but his attendants, reſpecting the biſhop's eccleſiaſtical character, ſcrupled to execute his commands; ſo that the king was obliged to ſeize him with his own hand. Odo appealed to the Pope: but the king replied, that he did not ſeize him as biſhop of Bayeux, but as earl of Kent; and, in that capacity, he expected, and would have, an account of his adminiſtration. He was therefore ſent priſoner to Normandy; and, notwithſtanding all the remonſtrances and threats of pope Gregory, was detained in cuſtody during the remainder of William's reign.

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Soon after this, William felt a ſevere blow in the death of Matilda his queen; and, almoſt at the ſame time, received information of a general inſurrection in Maine, the nobility of which had always been averſe to his government. Upon his arrival on the continent, he found that the inſurgents had been ſecretly aſſiſted and excited by the king of France, who took all opportunities of leſſening the Norman power, by creating diſſenſions among the nobles. His diſpleaſure on this account was very much increaſed, by notice he received of ſome railleries thrown out againſt him by the French monarch. It ſeems that William, who was become corpulent, had been detained in bed ſome time by ſickneſs; and Philip was heard to ſay, that he only lay in of a big belly. This ſo provoked the Engliſh monarch, that he ſent him word, he would ſoon be up, and would, at his churching, preſent ſuch a number of tapers as would ſet the kingdom of France in a flame.

91
And of the king.

To perform this promiſe, he levied a powerful army; and, entering the Iſle of France, deſtroyed every thing with fire and ſword. He took the town of Mante, and reduced it to aſhes. But a period was ſoon put to the conqueſts and to the life of this great warrior by an accident. His horſe happening to put his fore feet on ſome hot aſhes, plunged ſo violently, that the rider was thrown forward, and bruiſed his belly on the pommel of the ſaddle. Being now in a bad habit of body, as well as ſomewhat advanced in years, he began to be apprehenſive of the conſequences, and ordered himſelf to be carried in a litter to the monaſtery of St Gervaiſe. Finding his illneſs increaſe, and being ſenſible of the approach of death, he diſcovered at laſt the vanity of all human grandeur; and was ſtruck with remorſe for thoſe many cruelties and violences of which he had been guilty. He endeavoured to make compenſation by preſents to churches and monaſteries, and gave orders for the liberation of ſeveral Engliſh noblemen. He was even prevailed upon, though not without reluctance, to releaſe his brother Odo, againſt whom he was very much incenſed. He left Normandy and Maine to his eldeſt ſon Robert. He wrote to Lanfranc the primate of England, deſiring him to crown William king of England. To Henry he bequeathed nothing but the poſſeſſions of his mother Matilda; but foretold, that one day he would ſurpaſs both his brothers in power and opulence. He expired on the 9th September 1087, in the 63d year of his age, in the 21ſt of his reign over England, and 54th of that over Normandy.

93
William Rufus.

William, ſurnamed *Rufus*, from his red hair, was in Normandy at the time of his father's illneſs. He no ſooner received the letter for Lanfranc, than, leaving his father in the agonies of death, he ſet out for England; where he arrived before intelligence of the deceaſe of the Conqueror had reached that kingdom. Being ſenſible that his brother Robert, as being the eldeſt ſon, had a preferable title to himſelf, he uſed the utmoſt diſpatch in getting himſelf firmly eſtabliſhed on the throne. The Engliſh were ſo effectually ſubdued, that they made no oppoſition; but the Norman barons were attached to Robert. This prince was brave, open, ſincere, and generous; and even his predominant fault of indolence was not diſagreeable to thoſe haughty barons, who affected an almoſt total independence of their ſovereign. The king, on the other hand, was violent, haughty, and tyrannical. A powerful conſpiracy was therefore carried on againſt William; and Odo, biſhop of Bayeux, undertook to conduct it. Many of the moſt powerful nobility were concerned; and as the conſpirators expected to be in a ſhort time ſupported by powerful ſuccours from Normandy, they retired to their caſtles, and put themſelves in an offenſive poſture.

William, ſenſible of his danger, engaged the Engliſh on his ſide, by promiſing ſome mitigation of their hardſhips, and liberty to hunt in the royal foreſts. Robert, in the mean time, through his natural indolence, neglected to give his allies proper aſſiſtance. The conſpirators were obliged to ſubmit. Some of them were pardoned; but moſt of them confiſcated, and their eſtates beſtowed on the barons who had continued faithful to the king.

93
Proves a tyrant.

William, freed from this danger, thought no more of his promiſes to the Engliſh. He proved a greater tyrant than his father; and, after the death of Lanfranc, who had been his preceptor, and kept him within ſome bounds, he gave full ſcope to his violent and rapacious diſpoſition. Not content with oppreſſing the laity, he invaded the privileges of the church; which, in thoſe days, were held moſt ſacred. He ſeized the temporalities of all the vacant biſhoprics and abbeys, and openly put to ſale thoſe ſees and abbeys which he thought proper to diſpoſe of.

94
Attempts the conqueſt of Normandy.

Theſe proceedings occaſioned great murmurs among the eccleſiaſtics, which were quickly ſpread through the nation, but the terror of William's authority preſerved the public tranquillity. In 1090, the king thought himſelf ſtrong enough to attempt the conqueſt of Normandy, which at that time was in the greateſt confuſion through the indolent and negligent adminiſtration of Robert. Several of the barons had revolted, and theſe revolts were encouraged by the king of France. Robert alſo imagined he had reaſon to fear the intrigues of his other brother Henry, whom for 3000 merks he had put in poſſeſſion of *Cottentin*, near a third part of the duchy of Normandy. He therefore threw him into priſon; but finding himſelf threatened with an invaſion from the king of England, he gave Henry his liberty, and even made uſe of his aſſiſtance in ſuppreſſing the inſurrections of his rebellious ſubjects. William, however, was no ſooner landed in Normandy, than the nobility on both ſides interpoſed, and a treaty of peace was concluded. In this treaty Henry finding his intereſts entirely neglected, retired to St Michael's Mount, a ſtrong fortreſs on the coaſt of Normandy, and infeſted the neighbourhood with his incurſions. He was beſieged by his two brothers, and obliged to capitulate in a ſhort time; after which, being deprived of all his dominions, he wandered about for ſome time with very few attendants, and often in great poverty.

The peace with Robert was of no long duration. In the interval ſome hoſtilities with Scotland ſucceeded, and theſe terminated in the death of Malcolm king of that country; after which new broils enſued with Normandy. The rapacious temper of William prompted him to encroach upon his brother's territories, and the ſame rapacity prompted him to uſe a very extraordinary expedient in order to accompliſh his deſigns. Having gone over to Normandy to ſupport his partiſans, he ordered an army of 20,000 men to be raiſed in England, and conducted to the ſea-coaſt as if they were to be immediately embarked: but when they came there, inſtead of embarking, they were forced to pay the king ten ſhillings a man; after which they were diſmiſſed to their ſeveral counties. With this money William engaged the king of France to depart from the protection of Robert; and alſo bribed many of the Norman barons to revolt. He was called from Normandy, however, by an irruption of the Welſh; and having repulſed them, he was prevented from attempting other enterpriſes by a conſpiracy of his barons.

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In 1096, however, the ſuperſtition of Robert put the king of England in poſſeſſion of thoſe dominions which he had not been able to conquer by force of arms. The cruſades were now commenced, and Robert was deſirous of undertaking an expedition into the Holy Land. As money for this purpoſe was wanting, he mortgaged his dominions to his brother for 10,000 merks. The king raiſed the money by violent extortions on his ſubjects; forcing even the convents to melt their plate, in order to furniſh the quota demanded of them. He was then put in poſſeſſion of Normandy and Maine; and Robert with a magnificent train ſet out for the Holy Land.

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After the death of Lanfranc, the king had retained in his own hands the revenues of Canterbury, as he had done thoſe of many other biſhoprics; but falling into a dangerous illneſs, he was ſeized with remorſe; and the clergy repreſented to him that he was in danger of eternal perdition if he did not make atonement for thoſe impieties and ſacrileges of which he had been guilty. He therefore inſtantly reſolved to ſupply the vacancy of Canterbury: he ſent for Anſelm, a Piedmonteſe by birth, abbot of Bec in Normandy, who was much celebrated for his piety and devotion. The abbot refuſed the dignity with great earneſtneſs; fell on his knees, wept, and intreated the king to change his purpoſe; and when he found him obſtinate in forcing the paſtoral ſtaff upon him, he kept his fiſt ſo hard clenched, that it required the utmoſt violence of the byſtanders to open it, and force him to receive that enſign of his ſpiritual dignity. William ſoon after recovered his health, and with it his violence and rapacity. As he now ſpared the church no more than before, a quarrel with Anſelm ſoon enſued; and this was the more dangerous to the king, on account of the great character for piety which the primate had acquired by his zeal againſt abuſes of all kinds, particularly thoſe of dreſs and ornament.

At this time there was a mode which prevailed not only in England, but throughout Europe, both among men and women, of giving an enormous length to their ſhoes, drawing the toe to a ſharp point, and affixing to it the figure of a bird's bill, or ſome ſuch ornament, which was turned upwards, and which was often ſuſtained by gold or ſilver chains tied to the knee. The eccleſiaſtics took exception at this ornament, which they ſaid was an attempt to bely the ſcripture, where it is affirmed, that no man can add a cubit to his ſtature; and they not only declaimed againſt it with vehemence, but aſſembled ſome ſynods, in which the faſhion was abſolutely condemned. Such, however, are the contradictions in human nature, that all the influence of the clergy, which at that time was ſufficient to ſend vaſt multitudes of people into Aſia to butcher one another, was not able to prevail againſt thoſe long-pointed ſhoes. The faſhion, contrary to what hath happened to almoſt all others, maintained its ground for ſeveral centuries; and even Anſelm found his endeavours againſt it ineffectual. He was more ſucceſsful in decrying the long hair and curled locks then worn by the courtiers. He refuſed the aſhes on Aſh-Wedneſday to ſuch as were ſo accoutred; and his authority and eloquence had ſuch influence, that the young men univerſally abandoned that ornament, and appeared in the cropt hair recommended to them by the ſermons of the primate. For this reformation Anſelm is highly celebrated by his hiſtorian Eadmer, who was alſo his companion and ſecretary.

When William's profaneneſs returned with his health, he was engaged in almoſt perpetual conteſts with this auſtere prelate *. Theſe were pretty well ſettled, when the king, who had undertaken an expedition into Wales, required Anſelm to furniſh him with a certain number of ſoldiers. The primate regarded this as an invaſion of the rights of the church; and therefore, tho' he durſt not refuſe compliance, ſent the men ſo miſerably accoutred, that the king was exceedingly diſpleaſed, and threatened him with a proſecution. Anſelm demanded reſtitution of all his revenues which the king had ſeized, and appealed to the Pope. The quarrel, however, ran ſo high that the primate found it dangerous to remain in England. He deſired and obtained the king's permiſſion to retire beyond ſea. His temporalities were confiſcated immediately on his departure; but pope Urban received him as a martyr in the cauſe of religion, and even threatened the king with ſentence of excommunication. William, however, proceeded in his projects of ambition and violence, without regarding the threats of the Pope; who he knew was at that time too much engaged with the cruſades to mind any other buſineſs. Though his acquiſition of Maine and Normandy had brought him into perpetual conteſts with the haughty and turbulent barons who inhabited thoſe countries, and raiſed endleſs tumults and inſurrections; yet William ſeemed ſtill intent on extending his dominions either by purchaſe or conqueſt. William Earl of Poictiers and Duke of Guienne had reſolved upon an expedition to the Holy Land; and, for this purpoſe, had put himſelf at the head of a vaſt multitude, conſiſting, according to ſome hiſtorians, of 60,000 horſe, and a much greater number of foot. Like Robert of Normandy, he offered to mortgage his dominions for money ſufficient to conduct this multitude into Aſia. The king accepted his offer; and had prepared a fleet and army to take poſſeſſion of theſe dominions, when an unfortunate accident put an end to his projects and his life. He was engaged in hunting, the ſole amuſement, and indeed the principal occupation, of princes in thoſe rude times. Walter Tyrrel, a French gentleman remarkable for his ſkill in archery, attended him in this recreation, of which the new foreſt was the ſcene. William had diſmounted after a chaſe; and Tyrrel, impatient to ſhow his dexterity, let fly an arrow at a ſtag which ſuddenly ſtarted before him. The arrow glanced from a tree, and ſtruck the king to the heart. He inſtantly fell down dead; and Tyrrel, terrified at the accident, clapt ſpurs to his horſe, haſtened to the ſea-ſhore, and embarked for France, where he joined the cruſade that was ſetting out from that country. This happened on the 2d of Auguſt 1100, after the king had reigned 13 years, and lived about 40. His body was found in the woods by the country-people, and buried without ceremony at Wincheſter.

99
Prince Henry uſurps the crown.

After the death of William, the crown of right devolved to Robert his eldeſt brother; for William had no legitimate children. But what Robert had formerly loſt by his indolence, he was again deprived of by his abſence at the holy war. Prince Henry was in the foreſt with William Rufus at the time the latter was killed. He no ſooner heard the important news, than he hurried to Wincheſter, and ſecured the royal treaſure. William de Breteuil, keeper of the treaſure, arrived almoſt the ſame inſtant, and oppoſed his pretenſions; telling him, that the treaſure belonged to his elder brother, who was now his ſovereign, and for whom he was determined to keep it. But Henry, drawing his ſword, threatened him with inſtant death if he dared to diſobey him; and others of the late king's retinue, who came every moment to Wincheſter, joining the prince's party, he was obliged to deſiſt. Henry loſt no time in fully accompliſhing his purpoſe. In leſs than three days he got himſelf crowned king of England by Maurice biſhop of London. Preſent poſſeſſion ſupplied every deficiency of title; and no one dared to appear in defence of the abſent prince.

100
His charter in favour of the people.

The beginning of king Henry's reign promiſed to be favourable to the Engliſh liberty; owing chiefly to his fear of his brother. To conciliate the affections of his ſubjects, he paſſed a charter calculated to remove many of the grievous oppreſſions which had been complained of during the reigns of his father and brother. He promiſed, that at the death of any abbot or biſhop, he never would ſeize the revenues of the ſee or abbey during the vacancy, but would leave the whole to be reaped by the ſucceſſor; and that he would never let to farm any eccleſiaſtical benefice, or diſpoſe of it for money. To the laity he promiſed, that, upon the death of any earl, baron, or military tenant, his heir ſhould be admitted to the poſſeſſion of his eſtate, on paying a juſt and lawful relief; without being expoſed to thoſe enormous exactions which had been formerly required. He remitted the wardſhip of minors; and allowed guardians to be appointed, who ſhould be anſwerable for the truſt. He promiſed not to diſpoſe of any heireſs in marriage but by advice of all the barons; and if any baron intended to give his daughter, ſiſter, niece, or kinſwoman, in marriage, it ſhould only be neceſſary for him to conſult the king, who promiſed to take no money for his conſent, nor ever to refuſe permiſſion, unleſs the perſon to whom it was propoſed to marry her ſhould happen to be his enemy. He granted his barons and military tenants the power of bequeathing by will their money or perſonal eſtates; and if they neglected to make a will, he promiſed that their heirs ſhould ſucceed to them. He renounced the right of impoſing moneyage, and of levying taxes at pleaſure, on the farms which the barons kept in their own hands. He made ſome general profeſſions of moderating fines; he offered a pardon for all offences; and remitted all debts due to the crown. He alſo required, that the vaſſals of the barons ſhould enjoy the ſame privileges which he granted to his own barons; and he promiſed a general confirmation and obſervance of the *laws of king Edward* *. To give greater authenticity to theſe conceſſions, a

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* See Feodal Syſtem.

copy of the charter was lodged in ſome abbey of each county.

101
Quarrels with the primate.

King Henry, farther to increaſe his popularity, degraded and committed to priſon Ralph Flambard biſhop of Durham, who had been the chief inſtrument of oppreſſion under his brother. He ſent for Anſelm, who was then at Lyons, inviting him to return and take poſſeſſion of his dignities. Anſelm returned; but when Henry propoſed to him to do the ſame homage to him which he had done to his brother, the king met with an abſolute refuſal. During his exile, Anſelm had aſſiſted at the council of Bari; where, beſides fixing the controverſy between the Greek and Latin churches concerning the proceſſion of the Holy Ghoſt, the right of election to church-preferments was declared to belong to the clergy alone, and ſpiritual cenſures were denounced againſt all eccleſiaſtics who did homage to laymen for their fees and benefices, and on all laymen who exacted it. The rite of homage † by the feudal cuſtoms was, that the vaſſal ſhould throw himſelf on his knees, put his joined hands between thoſe of his ſuperior, and ſhould in that poſture ſwear fealty to him. But the council declared it execrable, that pure hands, which could create God, and offer him up for the ſalvation of mankind, ſhould be put, after this humiliating manner, between profane hands, which, beſides being inured to rapine and bloodſhed, were employed day and night in impure purpoſes and obſcene contacts. To this decree therefore Anſelm appealed; and declared, that ſo far from doing homage for his ſpiritual dignity, he would not even communicate with any eccleſiaſtic who paid that ſubmiſſion, or who accepted of inveſtitures from laymen. Henry durſt not inſiſt; and therefore deſired that the controverſy might be ſuſpended, and that meſſengers might be ſent to Rome to accommodate matters with the Pope, and to obtain his confirmation of the laws and cuſtoms of England.

† See Feudal *Tenure*.

102
He marries Matilda.

Henry now took another ſtep which ſeemed capable of confirming his claims to the crown without any danger of a rival. The Engliſh remembered with regret their Saxon monarchs, when they compared the liberty they enjoyed under them with the tyranny of the Normans. Some deſcendants of that favourite line ſtill remained; and among the reſt, Matilda, the niece of Edgar Atheling. Upon her the king fixed his eyes as a proper conſort, by whoſe means the breach between the Saxons and Normans might be cemented. A difficulty, however, occurred, becauſe ſhe had been educated in a nunnery. The affair was examined by Anſelm in a council of prelates and nobles ſummoned at Lambeth. Matilda there proved, that ſhe had put on the veil, not with a deſign of entering into a religious life, but merely in imitation of a cuſtom familiar to the Engliſh ladies, who protected their chaſtity from the brutal violence of the Normans by taking ſhelter under that habit, which amid the horrid licentiouſneſs of the times was yet generally revered. The council, ſenſible that even a princeſs had otherwiſe no ſecurity for her honour, admitted this reaſon as valid. They pronounced that Matilda was ſtill free to marry; and her nuptials with Henry were celebrated by Anſelm with great ſolemnity and pomp.

10
Crow
Engla
claim
Rober

While Henry was thus rendering himſelf popular at home, his brother Robert, who had loitered away a twelvemonth in Italy, where he married Sibylla daughter of the count of Converſana, arrived in England, in 1101, in order to put in his late and ineffectual claim to the crown. His fame, however, on account of the exploits he had performed in Paleſtine, was ſo great, that even yet he was joined by many noblemen of the firſt rank, and the whole nation ſeemed prepoſſeſſed in his favour. But Henry, having paid his court to Anſelm, by his means retained the army in his intereſts, and marched with them to Portſmouth, where Robert had landed his forces a few days before. The armies lay for ſome time in ſight of each other; when an accommodation was effected through the mediation of Anſelm and other great men. By this treaty it was agreed, that Robert ſhould reſign his pretenſions to England, and receive in lieu of them an annual penſion of 3000 marks; that if either of the princes died without iſſue, the other ſhould ſucceed to his dominions; that the adherents of each ſhould be pardoned, and reſtored to all their poſſeſſions either in Normandy or England; and that neither Robert nor Henry ſhould thenceforth encourage, receive, or protect, the enemies of each other.

The two princes ſeparated with mutual marks of friendſhip; but next year, Henry, under various pretences confiſcated the eſtates of almoſt all the noblemen who had favoured his brother's pretenſions. Robert, enraged at the fate of his friends, ventured to come to England in order to remonſtrate with his brother in perſon. But he met with ſuch a bad reception, that, apprehending his liberty to be in danger, he was glad to make his eſcape by reſigning his penſion.

1
Norn
invad
Henr

This infringement of the treaty was followed the enſuing year by an invaſion of Normandy, at the deſire of Robert's own ſubjects, whom he was totally incapable of governing *. The event of this war was the defeat and captivity of Robert, who was henceforth deprived not only of all his dominions, but of his perſonal liberty. He lived 28 years a priſoner, and died in the caſtle of Cardiff in Glamorganſhire. It is even ſaid by ſome, that he was deprived of his ſight by a red-hot copper-baſon applied to his eyes, and that king Henry appeaſed his conſcience by founding the monaſtery of Reading.

* See
*mandy*

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Quar
with
prim

The conqueſt of Normandy was completed in 1006; and next year the controverſy between the king and primate, concerning the inveſtitures of clergymen and their doing homage to princes, was reſumed. The king was very ſenſible that it was not his intereſt to quarrel with ſuch a powerful body as the clergy were at that time; and on the other hand he fully underſtood the neceſſity of guarding the prerogatives of the crown from their encroachments. While, therefore, he avoided an open rupture with Anſelm, he obſtinately refuſed to give up the privileges which had been enjoyed by his predeceſſors. On the firſt arrival of Anſelm, the king had avoided the diſpute in the manner already mentioned. A meſſenger was diſpatched to Rome, in order to compromiſe matters with the Pope. The meſſenger returned with an abſolute refuſal of the king's demands. One of the reaſons given by the Pope on this occaſion, was expreſſed in the following words: "It is monſtrous that a ſon ſhould pretend to beget his father, or a man to create his God: prieſts are called

called *gods* in ſcripture, as being the vicars of God: and will you, by your abominable pretenſions to grant them their inveſtiture, aſſume the right of creating them?" Henry was not yet convinced; but as he was determined to avoid, or at leaſt to delay, the coming to any dangerous extremity with the church, he perſuaded Anſelm, that by farther negociation he ſhould be able to compound matters with the Pope. Meſſengers were therefore diſpatched to Rome a ſecond time from the king; and alſo from Anſelm, who wanted to be fully aſſured of the Pope's intentions. They returned with letters wrote in the moſt arrogant and poſitive manner, both to the king and primate. The king ſuppreſſed the letter ſent to himſelf; and perſuaded the three biſhops, by whom it was ſent, to aſſert, upon their epiſcopal faith, that the Pope had aſſured them of his private good intentions towards king Henry, and of his reſolution not to reſent any future exertion of his prerogative in granting inveſtitures; though he himſelf ſcrupled to give this aſſurance under his hand, leſt other princes ſhould copy the example and aſſume a like privilege. Anſelm's two meſſengers, who were monks, affirmed that it was impoſſible this ſtory could have any foundation; but their word was not deemed equivalent to that of three biſhops; and the king, as if he had finally gained his cauſe, proceeded to fill the ſees of Hereford and Saliſbury, and to inveſt the new biſhops in the uſual manner. Anſelm, however, gave no credit to the aſſertions of the king's meſſengers; and therefore refuſed not only to conſecrate them, but even to communicate with them; and the biſhops themſelves, finding they were become univerſally odious, returned the enſigns of their ſpiritual dignity.

The quarrel continued between the king and primate, till the latter, ſenſible of his dangerous ſituation, deſired leave to make a journey to Rome, in order to lay the caſe before the Pope. This permiſſion was eaſily obtained; but no ſooner was the primate gone, than Henry confiſcated all his revenues, and ſent another meſſenger to negociate with the Pope. The new meſſenger told his holineſs, that his maſter would ſooner part with his crown than the right of granting inveſtitures. "And I (replied the Pope) would rather loſe my head than allow him to retain it." This quarrel now became very dangerous to the king; as he was threatened by the Pope with excommunication, which would have been attended with terrible conſequences. At laſt, however, a compromiſe was made in the following manner. Before biſhops took poſſeſſion of their dignities, they had formerly been accuſtomed to paſs through two ceremonials: They received, from the hands of the ſovereign, a ring and croſier as the ſymbols of their office, and this was called their *inveſtiture*: they alſo made thoſe ſubmiſſions to the prince, which were required of the vaſſals by the rites of the feudal law, and which received the name of *homage*. The Pope, therefore, was for the preſent contented with Henry's reſigning his right of granting inveſtitures, by which the ſpiritual dignity was ſuppoſed to be conferred; and he allowed the biſhops to do homage for their temporal properties and privileges. After this, the Pope allowed Anſelm to communicate with the prelates who had already received inveſtitures from the crown; and he only required of them ſome ſubmiſſions for their paſt conduct. He alſo granted to Anſelm a plenary power of remedying every diſorder, which he ſaid might ariſe from the barbarouſneſs of the country. About the ſame time the marriage of prieſts was prohibited; and even laymen were not allowed to marry within the ſeventh degree of affinity. By this contrivance the Pope augmented the profits which he reaped from granting diſpenſations, and likewiſe thoſe from divorces. For as the art of writing was then rare, and pariſh-regiſters were not regularly kept, it was not eaſy to aſcertain the degrees of affinity even among people of rank; and any man who had money to pay for it, might obtain a divorce, on pretence that his wife was more nearly related to him than was permitted by the canons. A decree was alſo publiſhed, prohibiting the clergy to wear long hair; and the king, tho' he would not reſign his prerogatives to the church, very willingly cut his hair in the form which was required of him, obliging all the courtiers at the ſame time to follow his example.

From the time of this compromiſe, which happened in 1107, to the year 1120, nothing remarkable happened except ſome ſlight commotions in Normandy: but this year, prince William, the king's only ſon, was unfortunately drowned off the coaſt of Normandy; and Henry was ſo much affected, that he is ſaid never afterwards to have ſmiled or recovered his wonted cheerfulneſs. It is very doubtful, however, whether the death of this prince was not an advantage to the Britiſh nation, ſince he was often heard to expreſs the utmoſt hatred to the natives; inſomuch that he had threatened, that when he came to the throne, he would make them draw the plough, and would turn them into beaſts of burden. Theſe prepoſſeſſions he inherited from his father; who, though he was wont, when it might ſerve his purpoſes, to value himſelf on his birth as a native of England, ſhowed, in the courſe of his government, an extreme prejudice againſt that people. All hopes of preferment to eccleſiaſtical as well as civil dignities are denied to the Engliſh during this whole reign; and any foreigner, however ignorant or worthleſs, was ſure to have the preference in every competition. The charter formerly mentioned, which the king granted at the beginning of his reign, was no more thought of; and the whole fell ſo much into neglect and oblivion, that in the following century, when the barons, who had heard an obſcure tradition of it, deſired to make it the model of the great charter which they exacted from king John, they could only find one copy of it in the whole kingdom; while the grievances, propoſed to be redreſſed by it, continued ſtill in their full extent.

106
Prince William drowned.

As Henry had now no legitimate children except Matilda, whom in 1110 he had betrothed, though only eight years of age, to the emperor of Germany, he was induced to marry a ſecond time in hopes of having ſons. He made his addreſſes accordingly to Adelais the daughter of Godfrey Duke of Lovaine, and niece to Pope Calixtus; a young princeſs of an amiable perſon. But Adelais brought him no children: and in 1135, the king died in Normandy, from eating too plentifully of lampreys; having lived 67 years, and reigned 35.

107
Death of King Henry.

By the will of king Henry, his daughter Matilda became heireſs of all his dominions. She had been

England. married, after her firſt huſband's death, to Geoffrey Plantagenet eldeſt ſon of the count of Anjou, by whom ſhe had a ſon named *Henry;* but as Geoffrey had given umbrage to the king of England in ſeveral inſtances, no notice was taken of him in the will. The nobility had already ſworn fealty to her; and the foremoſt to ſhow this mark of ſubmiſſion to the king's will had been Stephen, ſon of the count of Blois (who had married Adela the daughter of William the Conqueror). He had been married to Matilda daughter and heireſs of Euſtace Count of Boulogne; who brought him, beſides that feudal ſovereignty of France, a vaſt property in England, which in the diſtribution of lands had been conferred by the Conqueror on the family of Boulogne. By this marriage Stephen acquired a new connection with the royal family of England: for Mary, his wife's mother, was ſiſter to David the preſent king of Scotland, and to Matilda the firſt wife of Henry and mother of the empreſs. The king alſo, imagining that by the aggrandizement of Stephen he ſtrengthened the intereſt of his own family, had enriched him with many poſſeſſions; but inſtead of this, it appeared by the event that he had only put it more and more in his power to uſurp the throne.

108 Stephen uſurps the throne.

No ſooner was Henry dead, than Stephen haſtened from Normandy into England. The citizens of Dover and Canterbury, apprized of his purpoſe, ſhut their gates againſt him; but when he arrived at London, ſome of the lower claſs of people, inſtigated by his emiſſaries, immediately proclaimed him king. The archbiſhop of Canterbury refuſed to give him the royal unction; but this difficulty was got over by Stephen's brother the biſhop of Wincheſter. Hugh Bigod, ſteward of the houſehold, made oath before the primate, that the late king, on his death-bed, had diſcovered a diſſatisfaction with his daughter Matilda, and had expreſſed his intention of leaving the Count of Boulogne heir to all his dominions; and the biſhop, either believing, or pretending to believe, this teſtimony, gave Stephen the royal unction. Very few of the nobility attended his coronation; but none oppoſed his uſurpation, however unjuſt or flagrant.

Stephen, in order to eſtabliſh himſelf on the throne as firmly as poſſible, paſſed a charter, in which he made liberal promiſes to all ranks of men. To the clergy he promiſed, that he would ſpeedily fill all the vacant benefices, and never would levy any of their rents during the vacancy. To the nobility he gave liberty to hunt in their own foreſts; and to the people he promiſed to remit the tax of danegelt, and to reſtore the laws of Edward the Confeſſor. He ſeized the king's treaſure at Wincheſter, amounting to L. 100,000; with part of which money he hired mercenary ſoldiers from the continent; and with another part procured a bull from the Pope, confirming his title to the Engliſh throne.

Matilda, in the mean time, endeavoured to recover her juſt rights of which Stephen had deprived her; but for ſome time ſhe met with no ſucceſs either in England or Normandy. Her huſband Geoffrey himſelf was obliged to conclude a peace with Stephen, on condition of the king's paying him during that time an annual penſion of L. 5000.

Robert Earl of Gloceſter was the firſt who ſhook the power of Stephen. He was natural ſon to the late king; a man of great honour and ability, and was very much attached to the intereſts of Matilda. When Stephen uſurped the throne, he offered to do him homage, and take the oath of fealty; but with an expreſs condition, that the king ſhould maintain all his ſtipulations, and never invade any of Robert's rights or dignities. With this condition Stephen was obliged to comply, on account of the great power of that nobleman, though he knew that it was meant only to afford him a favourable opportunity of revolting when occaſion ſerved. The clergy imitated Robert's example; and annexed to their oath of allegiance the following condition, namely, that they were only bound as long as the king defended the eccleſiaſtical liberties, and ſupported the diſcipline of the church. The barons, in return for their ſubmiſſion, exacted terms of ſtill more pernicious tendency. Many of them required to have the right of fortifying their caſtles, and putting themſelves in a poſture of defence; and with this exorbitant demand the king was forced to comply. All England was immediately filled with theſe fortreſſes; which the noblemen garriſoned either with their vaſſals, or with licentious ſoldiers, who flocked to them from all quarters. The whole kingdom now became a ſcene of rapine and devaſtation. Wars were carried on by the nobles in every quarter; the barons even aſſumed the right of coining money, and of exerciſing, without appeal, every act of juriſdiction; and the inferior gentry, as well as the people, finding no defence from the laws, during this total diſſolution of ſovereign authority, were obliged, for their immediate ſafety, to pay court to ſome neighbouring chieftain, and to purchaſe his protection, both by ſubmitting to his exactions, and by aſſiſting him in his rapine upon others.

In 1137, the Earl of Gloceſter having projected an inſurrection, retired beyond ſea, ſent the king a defiance, and ſolemnly renounced his allegiance. The next year David king of Scotland appeared with an army in defence of his niece's title; and penetrating into Yorkſhire, committed the greateſt devaſtations. He was defeated, however, with great ſlaughter, at Northallerton, by ſome of the northern barons, who had raiſed a powerful army; and this ſucceſs ſo much overawed the malecontents in England, that Stephen's power might have received ſome ſtability, had he not unfortunately engaged himſelf in a conteſt with the clergy. He had already ſeen the miſchief ariſing from the liberty he had granted of fortifying ſo many caſtles in different parts of the kingdom. He therefore determined to abridge this liberty as much as poſſible; and for that purpoſe he began with the caſtles erected by the clergy, who ſeemed to have leſs right to theſe military ſecurities than the barons. Taking advantage therefore of a fray which had ariſen at court between the retinue of the biſhop of Saliſbury and the Earl of Brittany, he ſeized the biſhops both of Saliſbury and Lincoln, threw them into priſon, and obliged them to deliver up the caſtles which they had lately erected. This produced ſuch a violent commotion, that the opportunity ſeemed favourable to the pretenſions of Matilda. On the 22d of September 1139, ſhe landed in England with Robert Earl of Gloceſter, attended only by 140 knights; but her partizans daily increaſed, and ſhe was ſoon in a condition to face Steland. phen with equal forces in the field. Numberleſs encounters happened, the detail of which could afford very little entertainment to the reader. War was ſpread through every quarter; and the turbulent barons having, in a great meaſure, ſhaken off all reſtraint of government, and now obtained the ſanction of fighting in the cauſe of their country, redoubled their oppreſſions, tyrannies, and devaſtations. The caſtles of the nobility became receptacles of licenſed robbers; who, ſallying forth day and night, ſpoiled the open country, plundered the villages, and even cities. They tortured the captives to make them reveal their treaſures; ſold their perſons to ſlavery; and ſet fire to the houſes, after they had pillaged them of every thing valuable. In conſequence of this deſtruction, the land was left untilled; the inſtruments of huſbandry were abandoned; and a grievous famine reduced the nation to the moſt deplorable ſtate that can be imagined.

11 en de- l and pri- After a multitude of indeciſive conflicts, a battle enſued which ſeemed likely to enſure the public peace for ſome time. Stephen had marched his forces to relieve the city of Lincoln; the Earl of Gloceſter led a body of troops to aſſiſt thoſe of Matilda's party, who were beſieging that place. The two armies engaged on the 2d of February within ſight of the city, and a deſperate battle enſued. At laſt Stephen's army was defeated. He himſelf was for ſome time left without attendants; and fought on foot in the midſt of his enemies, aſſaulted by multitudes, and reſiſting all their efforts with aſtoniſhing intrepidity. Being hemmed in on every ſide, he forced a way for ſome time with his battle-ax; but that breaking, he drew his ſword, and with it furiouſly aſſailed his antagoniſts for ſome time longer. But at length the ſword alſo flying in pieces, he was obliged to ſurrender himſelf a priſoner. He was conducted to Gloceſter; and though at firſt treated with reſpect, he was in a ſhort time, upon ſome ſuſpicions, thrown into irons.

12 lda ned. About a month after, Matilda was crowned at Wincheſter with great ſolemnity; but ſoon ſhowed herſelf totally incapable of governing ſuch a turbulent nation. She determined to repreſs the power of the nobles, who had now left only the ſhadow of authority to their ſovereign. But being deſtitute of policy or prudence ſufficient to accompliſh ſo difficult an undertaking, a conſpiracy was ſoon formed againſt her, and the biſhop of Wincheſter detached a party of his friends and vaſſals to block up the city of London where the queen reſided. At the ſame time meaſures were taken to inſtigate the Londoners to a revolt, and to ſeize the queen's perſon. Matilda, having timely notice of this conſpiracy, fled to Wincheſter. Here ſhe was ſoon after beſieged by the biſhop: but the town being diſtreſſed by famine, ſhe with difficulty made her eſcape; while her brother the Earl of Gloceſter, endeavouring to follow, was taken priſoner, and exchanged for Stephen.

3 en ed. Matilda was now obliged to take ſhelter in Oxford, while Stephen reaſcended the throne. The civil war broke out with redoubled fury. Many battles were fought, and both parties were involved in many diſtreſſes. Matilda eſcaped from Oxford at a time when the fields were covered with ſnow, by being dreſſed all in white, with four knights her attendants dreſſed in the ſame colour. Another time Stephen was ſurpriſed by the earl of Gloceſter at Wilton, and made his eſcape with the utmoſt difficulty. At laſt Matilda was obliged to quit the kingdom; and the death of the earl of Gloceſter ſoon after ſeemed to give a fatal blow to her intereſts. In 1153, however, prince Henry, Matilda's ſon by her ſecond huſband Geoffrey, came over to England, in order once more to diſpute Stephen's pretenſions to the crown. After ſome ſucceſs on his firſt landing, he was oppoſed by Stephen with a powerful army, and matters ſeemed likely to come to the deciſion of a general engagement. But while the two armies continued within a quarter of a mile of each other, a treaty was ſet on foot by the interpoſition of William earl of Arundel, for terminating the diſpute in an amicable manner. The death of Euſtace, Stephen's ſon, whom he had deſigned for the throne, which happened during the courſe of the treaty, facilitated its concluſion. It was agreed, that Stephen ſhould reign during his life, and that juſtice ſhould be adminiſtered in his name; that Henry, on Stephen's death, ſhould ſucceed to the kingdom; and that William, Stephen's ſon, ſhould inherit Boulogne and his patrimonial eſtate. This treaty filled all Europe with joy; and after the barons had ſworn to it, Henry left England, and Stephen returned to the peaceable enjoyment of his throne. His reign, however, was but of ſhort continuance; his death happening on the 25th of October 1154. 114 His death.

Henry was on the continent beſieging a caſtle of one of the mutinous barons, when news was brought him of Stephen's death. But, as he was ſenſible of the goodneſs of his title, he did not abandon his enterprize till the place was reduced. He then ſet out on his journey, and was received in England with the utmoſt joy. The firſt acts of his reign ſeemed to promiſe an happy and proſperous adminiſtration. 115 Henry II. He inſtantly diſmiſſed the mercenary ſoldiers who had committed the greateſt diſorders throughout the nation. He ordered all the caſtles which had been erected ſince the death of Henry I. to be demoliſhed, except a few which he retained in his own hands for the protection of the kingdom. The adulterated coin which had been ſtruck during the reign of Stephen was cried down, and new money ſtruck of the right value and ſtandard. He reſumed many of thoſe benefactions which had been made to churches and monaſteries in the former reigns. He gave charters to ſeveral towns, by which the citizens claimed their freedom and privileges independent of any ſuperior but himſelf. Theſe charters were the ground-work of the Engliſh liberty; for thus a new order, namely, the more opulent of the people, began to claim a ſhare in the adminiſtration, as well as the nobility and clergy. Thus the feudal government was at firſt impaired; and liberty began to be more equally diffuſed throughout the nation.

Henry II. on his acceſſion to the Engliſh throne, found himſelf poſſeſſed of very extenſive dominions on the continent. In the right of his father, he poſſeſſed Anjou, Touraine, and Maine; in that of his mother, Normandy; in that of his wife, Guienne, Poictou, Xaintogne, Auvergne, Perigord, Angoumois, and the Limouſin. Soon after, he annexed Brittany to his other ſtates, by marrying his ſon, who was yet a child, to the heireſs of Brittany, who was a child alſo.

alſo, and was already in poſſeſſion of the ſuperiority over that province. Theſe territories compoſed above a third of the French monarchy, and were by far the moſt opulent part of it; ſo that Henry, though vaſſal to the king of France, was greatly ſuperior to him in power: and when England was added to all theſe, the French king had great reaſon to apprehend ſome diſaſter to himſelf and family. The king of England, however, reſided at too great a diſtance to be able to employ this formidable power with ſucceſs againſt the French monarch. He ſoon became a kind of ſtranger in his continental dominions; and his ſubjects there conſidered their allegiance as more naturally due to their ſuperior lord, who lived in their neighbourhood, and who was acknowledged to be the ſupreme head of their nation. Their immediate lord was often at too great a diſtance to protect them; and a commotion in any part of Henry's extenſive dominions gave great advantages againſt him. The wiſe and vigorous adminiſtration of Henry, however, counterbalanced in a great meaſure theſe diſadvantages; and he maintained a ſurpriſing tranquillity throughout his extenſive dominions during the greateſt part of his reign.

116
Monſtrous wickedneſs of the clergy.

Henry found no great difficulty in circumſcribing the power of the barons; but when he attempted to do the ſame thing with the clergy, he met with the moſt violent oppoſition. That body had carried their independence on the civil power ſo far, that now they ſeemed to aim at nothing leſs than a liberty to commit all manner of crimes with impunity. During the reign of Stephen, they had extorted an immunity from all but eccleſiaſtical penalties*; and that grant they were reſolved to maintain for the future. It may eaſily be ſuppoſed, that a law which thus ſcreened their wickedneſs, contributed to increaſe it; and we accordingly find upon record, not leſs than 100 murders committed by men in holy orders, in the ſhort period ſince the king's acceſſion, not one of which was puniſhed even with degradation; while the biſhops themſelves ſeemed to glory in this horrid indulgence. The king did not make any attempts againſt them during the life of Theobald archbiſhop of Canterbury, who was a man of a mild character, and beſides had great merit; becauſe, during the former reign, he had refuſed to put the crown on the head of Euſtace, Stephen's ſon. He died in 1162; and the king, after his death, advanced to the ſee of Canterbury Thomas a Becket, his chancellor, on whoſe compliance he thought he might entirely depend.

117
Conteſts of the king with Thomas a Becket.

The new archbiſhop was the firſt man of Engliſh pedigree, who, ſince the Norman conqueſt, had riſen to any conſiderable ſtation. Before his inſtalment in the ſee of Canterbury, Becket had been exceedingly complaiſant, good-humoured, and agreeable to his maſter; and had alſo been accuſtomed to live very freely. But no ſooner was he inveſted with this high dignity, than he totally altered his conduct, and put on all thoſe airs of affected and oſtentatious humility which could recommend him to the ſuperſtitious and ignorant multitude in that age. The firſt ſtep taken by this hypocrite after his advancement, was to reſign the office of chancellor. This he did without conſulting the king: the reaſon he gave was, that henceforth he muſt detach himſelf from ſecular affairs, and be ſolely employed in the duties of his ſacred function; but in reality, that he might break off all connexion with Henry. As he knew that the king intended to abridge the eccleſiaſtical power, he thought the beſt method would be to become himſelf the aggreſſor. He therefore ſummoned the earl of Clare to ſurrender the barony of Tunbridge; which, ever ſince the Conqueſt, had remained in the family of that nobleman; but which, as it had formerly belonged to the ſee of Canterbury, the primate pretended that his predeceſſors were prohibited by the canons from alienating.—William de Eynsford, a military tenant of the crown, was patron of a living which belonged to a manor that held of the archbiſhop of Canterbury; and Becket, without regard to William's right, preſented, on a new and illegal pretence, one Laurence to that living, who was violently expelled by Eynsford. Upon this, Eynsford was excommunicated. He complained to the king, that he, who held *in capite* of the crown, ſhould, contrary to the practice eſtabliſhed by the Conqueror and maintained ever ſince by his ſucceſſors, be ſubjected to that terrible ſentence, without the previous conſent of the ſovereign. Henry, by a meſſenger, commanded Becket to abſolve Eynsford. The haughty primate anſwered, that it belonged not to the king to inform him whom he ſhould abſolve, and whom excommunicate; but, after all, he was obliged to comply with the king's orders, though with the worſt grace imaginable.

As Henry perceived that the crown was now in danger, through the ſuperſtition of the people, of falling totally under the power of the clergy, he reſolved to exert himſelf to the utmoſt againſt their ſcandalous uſurpations. Among their other inventions to obtain money, they had now inculcated the neceſſity of penance as an atonement for ſin; and having again introduced the practice of paying them large ſums as an equivalent for theſe penances, the ſins of the people had thus become a revenue to the prieſts; and the king computed, that, by this invention alone, they levied more money from his ſubjects than what flowed by all the funds and taxes into the royal exchequer. To eaſe the people of ſo heavy and arbitrary an impoſition, the king required, that a civil officer of his appointment ſhould be preſent in all eccleſiaſtical courts, and ſhould for the future give his conſent to every compoſition made for ſpiritual offences. About this time alſo the king had an opportunity of proceeding againſt the clergy on another footing. A clerk in Worceſterſhire, having debauched a gentleman's daughter, murdered her father. The king required that the clerk ſhould be delivered up to the magiſtrate. Becket pleaded the privileges of the church; confined the criminal in the biſhop's priſon, leſt he ſhould be ſeized by the king's officers; and maintained that no greater puniſhment could be inflicted on him than degradation. The king then required, that, immediately after he was degraded, he ſhould be tried by the civil powers; but the primate aſſerted, that it was iniquitous to try a man twice upon the ſame accuſation, and for the ſame crime. Upon this, Henry ſummoned an aſſembly of all the prelates in England; and put to them this deciſive queſtion, Whether or not they were willing to ſubmit to the ancient laws and cuſtoms of the kingdom? The biſhops unanimouſly replied, that they were willing, *ſaving their own order*. The king was

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* See (Benefit of) *Clergy*.

provoked to the laſt degree at this equivocal anſwer. He left the aſſembly with evident marks of diſpleaſure; and required the primate inſtantly to ſurrender the caſtles of Eye and Berkham. The other prelates were terrified; but Becket continued inflexible: however, he was at laſt prevailed upon, by the interpoſition of Philip the pope's legate and almoner, to retract the ſaving clauſe, and promiſe without any reſerve to obſerve the ancient cuſtoms.

The king was not now to be ſatisfied with general promiſes from the clergy. He was determined that the ancient laws and cuſtoms ſhould be defined, as well as the privileges of the clergy. He therefore ſummoned another great council of the clergy and nobility at Clarendon, to whom he ſubmitted this important affair. A number of regulations was there drawn up, which were afterwards well known by the title of the *Conſtitutions of Clarendon*. By theſe it was enacted, that clergymen accuſed of any crime ſhould be tried in the civil courts; that laymen ſhould not be tried in ſpiritual courts, except by legal and reputable witneſſes; that the king ſhould ultimately judge in eccleſiaſtical and ſpiritual appeals; that the archbiſhops and biſhops ſhould be regarded as barons, and obliged to contribute to the public expences like other perſons of their rank; that the goods forfeited to the king, ſhould not be protected in churches or church-yards by the clergy; and that the ſons of villeins ſhould not take orders without the conſent of their lord. Theſe, with ſome others of leſs conſequence, to the number of 16, were ſubſcribed by all the biſhops preſent, and even by Becket himſelf; who, at firſt, ſhowed ſome reluctance.

Nothing now remained but to get the conſtitutions ratified by the Pope; but in this the king was diſappointed. The Pope rejected them with the utmoſt indignation; and, out of 16, admitted only ſix, which he thought were not important enough to deſerve cenſure.—Becket was now mortified to the higheſt degree. He retracted his conſent to the conſtitutions, redoubled his auſterities, and even refuſed to execute any part of his ſacerdotal function till he had obtained abſolution from his holineſs. Henry, conſidering theſe humilities as inſults offered to himſelf, deſired the Pope to ſend him a legate. He did ſo; but annexed a clauſe to his commiſſion, by which he was prohibited from acting againſt the archbiſhop of Canterbury. The king ſent back the commiſſion to the Pope; and being now exaſperated beyond all patience, commenced furious proſecutions againſt Becket. He firſt ſued him for ſome lands belonging to his primacy; and Becket being detained by ſickneſs from coming into court, his non-attendance was conſtrued into diſreſpect. The primate afterwards defended his cauſe in perſon; but all his goods and chattels were confiſcated, and the biſhop of Wincheſter was obliged to pronounce the ſentence. Another ſuit was commenced againſt him for L. 300, which he had levied on the honours of Eye and Berkham, and the primate agreed to give ſecurities for the payment of the ſum. The next day a third ſuit was commenced againſt him for 1000 marks, which the king had lent him upon ſome former occaſion: and, immediately upon the back of theſe, a ſtill greater demand was made; namely, that Becket ſhould give an account of the money he had received and expended during the time he was chancellor. The money was computed at no leſs than 40,000 marks; and the primate, unable either to give an account, or find ſecurities, took the following extraordinary method of evading the king's deſigns. He arrayed himſelf in his epiſcopal veſtments; and with the croſs in his hand, went forward to the palace. Having entered the royal apartments, he ſat down, holding up the croſs as his banner and protection. The king, who ſat in an inner apartment, ordered by proclamation all the prelates and nobility to attend him; to whom he loudly complained of Becket's inſolence. The whole council joined in condemning this inſtance of his unaccountable pride; and determined to expoſtulate with him about his inconſiſtency concerning the conſtitutions of Clarendon. But all their meſſages, threats, and arguments, were to no purpoſe. Becket put himſelf, in the moſt ſolemn manner, under the protection of the ſupreme pontiff, and appealed to him againſt any penalty which his iniquitous judges might think proper to inflict. Then leaving the palace, he aſked the king's immediate permiſſion to quit Northampton; but being refuſed, he ſecretly withdrew in diſguiſe, and at laſt found means to croſs over to the continent.

118
Becket flies to the continent.

Becket was received with the greateſt marks of eſteem, firſt by the king of France (who hated Henry on account of his great power), and then by the Pope, whoſe cauſe he had ſo ſtrenuouſly defended in England. Henry at the ſame time ſent ambaſſadors to the Pope, who were treated with coolneſs and contempt, while Becket was honoured with the greateſt marks of diſtinction. Theſe favours beſtowed upon an exile and a perjured traitor (for ſuch had been Becket's ſentence of condemnation in England), irritated the king to ſuch a degree, that he reſolved to throw off at once all dependence upon the Pope. He accordingly iſſued out orders to his juſticiaries; inhibiting, under ſevere penalties, all appeals to the Pope or the archbiſhop; and forbidding any of them to receive mandates from them, or to apply to their authority. He declared it treaſonable to bring over from either of them any interdict upon the kingdom. This he made puniſhable in ſecular clergymen by the loſs of their livings, and by caſtration; in regulars, by the amputation of their feet; and in laymen, by death. On the other hand, the Pope and the archbiſhop did not fail to iſſue forth their fulminations in ſuch a manner as to ſhake the very foundation of the king's authority. Becket excommunicated by name all the king's chief miniſters who had been concerned in ſequeſtrating the revenues of his ſee, and all who obeyed or favoured the conſtitutions of Clarendon. He even threatened to excommunicate the king if he did not ſpeedily repent; and had not the Pope himſelf been threatened every day with the machinations of an antipope, whoſe pretenſions he was afraid the king of England might ſupport, the ſentence of excommunication would certainly have been denounced.

At firſt, Henry paid little regard to theſe fulminations; but afterwards, when he found that his authority over his ſubjects began to decline on that account, and that his rivals on the continent were endeavouring to diſturb the tranquillity of his dominions, he began ſincerely to deſire a reconciliation. This the Pope and

Becket alſo became deſirous of, becauſe they ſaw that their utmoſt endeavours were inſufficient to draw Henry's ſubjects into a revolt againſt him. The treaty of accommodation, however, was often broke off, through the extreme jealouſy of each of the parties; but at length, by the mediation of the Pope's legate, all differences were adjuſted, and Becket was reinſtated in the ſee of Canterbury.

119
Is reſtored, and behaves with his former inſolence.

On the recovery of his dignity, the primate behaved with all his uſual arrogance. Inſtead of retiring quietly to his dioceſe when he landed in England, he made a progreſs through Kent with all the ſplendor and magnificence of a ſovereign pontiff. As he approached Southwark, the clergy, the laity, and all ranks of people, came forth to meet him, and celebrated his triumphal entry with hymns of joy. Being thus confident of the ſupport of the people, he reſolved to make his enemies feel the ſevereſt effects of his vengeance. He ſuſpended the archbiſhop of York, who had crowned Henry's eldeſt ſon in his abſence. He excommunicated the biſhops of London and Saliſbury, with ſome of the principal nobility and prelates who had aſſiſted at the coronation. One man he excommunicated for having ſpoken againſt him, and another for having cut off the tail of one of his horſes. The excommunicated and degraded prelates immediately made their complaints to the king; and he having dropped ſome paſſionate expreſſions, intimating a deſire to have Becket's life taken away, the ſuppoſed will of the king was inſtantly accompliſhed; nor could the king's expreſs orders to the contrary arrive time enough to hinder the execution of this fatal purpoſe. See Becket.

120
Grief of the king for his death.

The king was thrown into the utmoſt conſternation on hearing of Becket's murder. He knew that the primate's death would accompliſh what his moſt violent oppoſition during his life could never have done, and therefore he gave himſelf up to ſorrow; for three days he even refuſed all nouriſhment; till at laſt his courtiers were obliged to break in upon his ſolitude, and induce him to acquieſce in an event which could not poſſibly be recalled. The pope was with ſome difficulty made ſenſible of the king's innocence; but refuſed to grant him a pardon, except on condition that he ſhould make every future ſubmiſſion and perform every injunction the holy ſee thought proper to demand. When things were thus adjuſted, the aſſaſſins who had murdered Becket were allowed to retire in ſafety to the enjoyment of their former dignities; and the king, with a view to divert the minds of the people to a different object, undertook an expedition into Ireland, and totally reduced that iſland. See Ireland.

121
Diſſenſions in Henry's family.

The king was ſcarce freed from the war with Ireland, and the dangerous controverſy which he had engaged in with the church of Rome, when he found himſelf involved in the moſt unnatural conteſts with his children, to whom he had always behaved in the moſt tender and affectionate manner. He had ordered Henry his eldeſt ſon to be anointed king; and had deſtined him for his ſucceſſor in the kingdom of England, the duchy of Normandy, and the counties of Anjou, Maine, and Touraine; territories which lay contiguous, and which might thus eaſily lend their aſſiſtance to one another. Richard his ſecond ſon was inveſted in the duchy of Guienne and county of Poictou: Geoffrey, his third ſon, inherited, in right of his wife, the duchy of Brittany: and the new conqueſt of Ireland was deſtined for the appendage of John his fourth ſon, for whom he had negociated a marriage with Adelais the only daughter of Humbert count of Savoy and Maurienne; and with whom he was to receive as a dowry very conſiderable demeſnes in Piedmont, Savoy, Breſſe, and Dauphiny. This greatneſs of Henry's family alarmed the king of France; and he therefore excited young prince Henry to demand of his father, either the immediate reſignation of the crown of England, or the duchy of Normandy. The king refuſed to comply with ſuch an extravagant demand; upon which the prince made his eſcape to Paris, where he was protected by the French king. This happened in 1173; and the ſame year, queen Eleanor, finding that ſhe was now grown very diſagreeable to the king, communicated her diſcontent to her two younger children Geoffrey and Richard, whom ſhe engaged alſo to demand the territories aſſigned them, and then fly to the court of France. The queen herſelf was meditating an eſcape to the ſame court, and had put on man's apparel for that purpoſe, when ſhe was ſeized and confined by Henry's order. The licentious barons in the mean time wiſhed for a change of government; hoping to have liberty, under young and unexperienced princes, to commit thoſe rapines and violences which they could not do with ſafety when governed by ſuch a prudent and vigilant king as Henry. In the midſt of this univerſal defection, however, the Engliſh monarch ſtill retained his uſual intrepidity, and prepared with as much vigour as poſſible for the conteſt. As he could depend on the fidelity of very few of his nobility, he was obliged to enliſt in his ſervice a number of deſperate ruffians called *Brabençons*, and ſometimes *Routiers* or *Cottereaux*, though for what reaſon is not mentioned in hiſtory. Theſe banditti were very numerous during the times of the feudal government, when many private wars were carried on between the nobles; and 20,000 of theſe, with a few forces furniſhed by his faithful barons, compoſed the whole of Henry's army on this occaſion.

1
Quee
leano
fined.

With this force the king of England totally overthrew the ſchemes of his enemies on the continent; but being very deſirous of putting an end to the war, he this very year (1173) agreed to a conference with the king of France. At this interview, Henry offered his children the moſt advantageous terms. He inſiſted only on retaining the ſovereign authority in all his dominions. To Henry he offered half the revenues of the crown of England, with ſome places of ſurety in that kingdom; or if he choſe rather to reſide in Normandy, half the revenues of that duchy, with all thoſe of Anjou. He made a like offer to Richard in Guienne; he promiſed to reſign all Brittany to Geoffroy; and if theſe conceſſions were not deemed ſufficient, he agreed to add to them whatever the Pope's legates, who were preſent, ſhould require of him. The conference, however, was broke off by the violence of the earl of Leiceſter; who not only reproached Henry in the moſt indecent manner, but even put his hand to his ſword, as if he intended to attempt ſome violence againſt him.

In the mean time, the moſt of the Engliſh nobility united in oppoſition againſt their ſovereign; and an irruption at this time by the king of Scotland aſſiſted their rebellious ſchemes. The earl of Leiceſter ſoon after invaded Suffolk at the head of a body of Flemings; but they were repulſed with great ſlaughter, and the earl himſelf was taken priſoner. Soon after, William king of Scotland, who had been repulſed, and agreed to a ceſſation of arms, broke the truce, and invaded England with an army of 80,000 men, committing the moſt terrible devaſtations. Henry in the mean time, to reconcile himſelf thoroughly to the church, performed the penances at the tomb of Thomas a Becket which he had formerly promiſed to do. As ſoon as he came within ſight of the church of Canterbury, he alighted from his horſe, walked barefoot towards the town, and proſtrated himſelf before the ſhrine of the ſaint. He remained a whole day in prayer and faſting, watched the holy relics all night, made a grant of 50l. a-year to the convent for a conſtant ſupply of tapers to illuminate the ſhrine; and not ſatisfied with theſe ſubmiſſions, he aſſembled a chapter of monks, diſrobed himſelf before them, put a ſcourge into each of their hands, and preſented his bare ſhoulders to their ſtrokes. Next day he received abſolution; and, departing for London, had the agreeable news of the defeat and captivity of William king of Scotland, which happened on the very day of his abſolution.

This victory proved deciſive in Henry's favour. The Engliſh barons who had revolted, or were preparing for a revolt, inſtantly delivered up their caſtles to the victor, and the kingdom was in a few weeks reſtored to perfect tranquillity. Prince Henry, who was ready to embark with a great army to join the Engliſh rebels, abandoned all thoughts of the enterpriſe. Soon after a treaty was concluded with the king of France; in which Henry granted his children much leſs advantageous terms than he had offered them before. The principal were, ſome penſions for their ſupport, caſtles for their reſidence, and an indemnity to all their adherents. The greateſt ſufferer by this war was William king of Scotland. He was compelled to ſign a treaty, by which he obliged himſelf to do homage to Henry for the kingdom of Scotland. It was agreed, that his barons and biſhops ſhould do the ſame; and that the fortreſſes of Edinburgh, Stirling, Berwick, Roxburgh, and Jedburgh, ſhould be delivered into the hands of the conqueror till the articles were performed. This treaty was executed moſt punctually and rigorouſly on the 10th of Auguſt 1175. The king, barons, and prelates of Scotland, did homage to Henry in the cathedral of York; the greateſt humiliation to which the Scottiſh nation had ever been ſubjected.

Henry was now freed from all troubles either at home or abroad, for five years; during which time he made ſeveral ſalutary laws for the good of his kingdom. But, in 1180, the ambitious ſpirits of his children involved him in freſh calamities. Richard, who had been inveſted by his father with the ſovereignty of Guienne, refuſed to do homage to his elder brother, as king Henry had required him to do. Young Henry and Geoffrey, uniting their arms, invaded their brother's dominions; and while the king was endeavouring to compoſe their differences, he found himſelf conſpired againſt by them all. The conſpiracy, however, was defeated by the death of prince Henry in 1183. He had retired to Martel, a caſtle near Turenne, where he was ſeized with a fever; and perceiving the approaches of death, he was at laſt ſtruck with remorſe for his undutiful behaviour towards his father. He ſent a meſſenger to the king, who was not far diſtant; expreſſed his contrition for his faults; and intreated the favour of a viſit, that he might at leaſt die with the ſatisfaction of having received his forgiveneſs. The king, who had ſo often experienced his ſon's ingratitude and violence, apprehended that his ſickneſs was entirely a feint, and dared not truſt himſelf in the prince's hands. But ſoon after, receiving certain intelligence of his death, and proofs of his ſincere repentance, the good old king was affected with the deepeſt ſorrow. He thrice fainted away; he accuſed his own hard-heartedneſs in refuſing the dying requeſt of his ſon; and he lamented that he had deprived the prince of the laſt opportunity of making atonement for his offences.

England.

Prince Henry, who died in the 28th year of his age, left no poſterity. His brother Richard ſucceeded to his dominions, and ſoon diſcovered as turbulent a ſpirit as that which had actuated his brother. He refuſed to give up Guienne, which Henry had deſigned for his fourth ſon John; and even made preparations for carrying on war againſt his father, and brother Geoffrey. Henry ſent for Eleanor his queen, the heireſs of Guienne; to whom Richard, either dreading an inſurrection in her favour, or out of a ſenſe of duty, willingly yielded up the territory, and retired peaceably to his father's court. This breach, however, was no ſooner made up, than Geoffrey, demanded Anjou to be added to his dominions in Brittany. This the king refuſed; upon which he fled to the court of France, and prepared to levy an army againſt his father. Henry, however, was freed from the danger which threatened him from that quarter, by his ſon's death, who was killed in a tournament at Paris. The loſs of this prince gave few, except the king himſelf, any uneaſineſs; for he was univerſally hated, and went among the people by the name of the *Child of Perdition*. The widow of Geoffrey, ſoon after his deceaſe, was delivered of a ſon, who received the name of *Arthur*, and was inveſted in the duchy of Brittany, under the guardianſhip of his grandfather, who, as duke of Normandy, was alſo ſuperior lord of that territory. Philip, as lord paramount, diſputed for ſome time his title to this wardſhip; but was obliged to yield to the inclinations of the Bretons, who preferred the government of Henry. Some other cauſes inflamed the diſſenſion between theſe two monarchs, and Philip once more ſeduced Richard from his duty. He inſiſted, that his marriage with Adelais, Philip's ſiſter, ſhould be immediately completed. and threatened to enforce his pretenſions with a formidable army. This occaſioned another conference between Giſors and Trie, the uſual place of meeting, under a vaſt elm that is ſaid to have ſhaded more than an acre. In the midſt of this conference the archbiſhop of Tyre appeared before the aſſembly in the moſt miſerable habit, and begged aſſiſtance againſt the infidels, who, under Saladin, had almoſt totally expelled the Chriſtians from Aſia. His intelligence appeared ſo very diſmal, that the kings of France and England laid aſide their animoſity. Both of them immediately took the croſs; but Richard, who had long wiſhed to have all the glory of ſuch an expedition to himſelf, could not bear to have even his father for a partner in his victories. He therefore entered into a confederacy with the king of France; ſo that Henry found himſelf at laſt obliged to give up all thoughts of the cruſade, in order to defend himſelf againſt this unnatural combination. The event of the war proved very unfortunate for Henry, who loſt ſeveral towns, and narrowly eſcaped falling into the hands of the enemy himſelf. At laſt a treaty was concluded at the interceſſion of the duke of Burgundy, the count of Flanders, and the archbiſhop of Rheims; but upon terms very humiliating to the king of England. It was agreed, that Richard ſhould marry the princeſs Adelais, and be crowned king of England during the lifetime of his father; that Henry ſhould pay 20,000 marks to the king of France, as a compenſation for the charges of the war; that his own barons ſhould engage to make him obſerve this treaty, and in caſe of violating it, to join Philip and Richard againſt him; and that all his vaſſals who had eſpouſed the cauſe of Richard ſhould receive an indemnity for their offence.

126
His extreme grief and death.

Theſe terms, mortifying as they were, Henry bore with patience; but when, upon receiving a liſt of the barons that were to be pardoned, he found his own ſon John, who was his favourite, among them, he could no longer ſupport his grief. He broke out into the moſt lamentable expreſſions of deſpair; curſed the day in which he received his miſerable being; and beſtowed on his ungrateful children a malediction which he could never afterwards be prevailed upon to retract. Soon after, he fell into a lingering fever occaſioned by his grief; and of this he died on the 6th of July 1189, in the 58th year of his age and 35th of his reign. His natural ſon Geoffrey, who alone had behaved dutifully towards him, attended his corpſe to the nunnery of Fontevrault, where it lay in ſtate in the abbey-church. Next day Richard, who came to viſit the dead body of his father, was ſtruck with horror at the ſight. At his approach, the blood was ſeen to guſh out at the mouth and noſtrils of the corpſe; and this accident was, by the ſuperſtition of the times, interpreted as the moſt dreadful rebuke. Richard could not endure the ſight. He exclaimed that he was his father's murderer; and expreſſed a ſtrong, though too late, ſenſe of his undutiful conduct.

117
Richard I.

Richard ſucceeded to the throne without oppoſition, immediately after his father's death; and, on his acceſſion, ſet his mother Eleanor (who had been again confined) at liberty. A romantic deſire for ſtrange adventures, and an immoderate zeal for the external rites of religion, were the ruling paſſions of the times. By the firſt of theſe Richard was inflamed to the higheſt degree, and therefore behaved as if the whole deſign of his government had been to attempt the recovery of the Holy Land from the Infidels. The ſuperſtition of the people ſhowed itſelf in a moſt violent and tragical manner on the very day of the king's coronation.

128
Maſſacre of the Jews.

The Jews were the objects of univerſal hatred, ſo that Richard had iſſued out orders forbidding any of them from appearing at his coronation. But ſome of them bringing him large preſents from their nation, preſumed, notwithſtanding theſe orders, to approach the hall in which the king dined. Being diſcovered, they were expoſed to the inſults and injuries of the byſtanders; in conſequence of which they fled, and were purſued by the people. A report was ſpread, that the king had given orders to maſſacre all the Jews. This ſuppoſed command was executed in the moſt cruel manner. Multitudes were ſlaughtered in the city of London, and this example was followed in moſt of the cities in England. Five hundred Jews had retired into York caſtle for ſafety: but finding themſelves unable to defend the place, they murdered their wives and children; threw the dead bodies over the wall againſt their enemies who attempted to ſcale it; and then, ſetting fire to the houſes, periſhed in the flames. The gentry in the neighbourhood, who were all indebted to the Jews, ran to the cathedral where their bonds were kept, and made a ſolemn bonefire of them before the altar.

12
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Richard immediately began to take meaſures for his expedition into Paleſtine. His father had left him 100,000 merks; and this ſum he augmented by all expedients he could think of, however pernicious to the public, or dangerous to the royal authority. He ſet up to ſale the revenues and manors of the crown, and ſeveral offices of the greateſt truſt and power. Liberties, charters, caſtles, were given to the beſt bidders. His friends warned him of the danger attending this venality; but he told them he would ſell the city of London itſelf, if he could find a purchaſer. Numerous exactions were alſo practiſed upon all ranks and ſtations; menaces, promiſes, and expoſtulations, were uſed to fright the timid, and allure the avaricious. A zealous preacher of thoſe times was emboldened to remonſtrate againſt the king's conduct; and adviſed him to part with his three daughters, which were pride, avarice, and ſenſuality. To this Richard readily replied, "You counſel right, my friend: and I have already provided huſbands for them all. I will diſpoſe of my pride to the templars; my avarice to the monks; and as for my ſenſuality, the clergy ſhall ſhare that among them." At length the king having got together a ſufficient ſupply for his undertaking, and even ſold his ſuperiority over Scotland for a moderate ſum, ſet out for the Holy Land; whither he was impelled by repeated meſſages from the king of France, who was ready to embark in the ſame enterpriſe.

An account of Richard's exploits in this expedition is given under the articles Egypt, Sicily, Cyprus, &c.—Having at laſt concluded a truce with Saladin, he ſet out on his return for England. He was, however, at a loſs how to proceed. He durſt not return by the way he came, as this would put him in the power of the king of France, between whom and the king of England an irreconcileable enmity had taken place. No way therefore was left, but by going more to the north; for which reaſon he took ſhipping for Italy, but was wrecked near Aquileia. From thence he travelled towards Raguſa, and reſolved to make his way through Germany in the habit of a pilgrim.

13
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But his expences and liberalities having betrayed him notwithſtanding this diſguiſe, he was arreſted by Leopold duke of Auſtria, who commanded him to be loaded with ſhackles. This prince had ſerved under Richard at the ſiege of Acres (the ancient Ptolemais), where having received ſome diſguſt, he took this baſe method of revenging himſelf. Henry VI. emperor of Germany, was then equally an enemy to Richard on account of his having married Berengaria the daughter of Tancred king of Sicily. He therefore required the royal captive to be delivered up to him, and ſtipulated a large ſum of money to the duke as a reward for his ſervice.

The kingdom of England in the mean time was in great confuſion. Richard had left it under the direction of Hugh biſhop of Durham, and Longchamp biſhop of Ely. The tempers of theſe prelates being very different, an animoſity between them ſoon took place. Longchamp at laſt arreſted his colleague, and obliged him to reſign his power in order to obtain his liberty. The king, by many letters, commanded Longchamp to replace his coadjutor, but to no purpoſe. When the ſituation of the king became uncertain, Longchamp tyrannized to ſuch a degree, that John the king's brother thought proper to oppoſe him. He then left the kingdom; and upon this the archbiſhop of Rouen was made juſticiary in his room. The king of France being informed of theſe diſſenſions, ſtrove to increaſe them as much as poſſible; and had even almoſt prevailed upon John to throw off his allegiance, by promiſing to put him in poſſeſſion of all Richard's continental dominions.

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When the Engliſh firſt received the news of Richard's captivity, a general indignation was excited through the whole nation. The greateſt, and almoſt the only traitor in the kingdom, was the king's own brother John. On the very firſt invitation from the court of France, he went abroad, and held a conſultation with Philip, the object of which was the perpetual ruin and captivity of his unhappy brother. He promiſed to deliver into Philip's hands a great part of Normandy; and, in return, he received the inveſtiture of all Richard's tranſmarine dominions: it is even ſaid, that he did homage to the French king for the crown of England.

In conſequence of this treaty, Philip invaded Normandy, and made conſiderable progreſs in the conqueſt of it. He was, however, at laſt repulſed by the Earl of Leiceſter, who was now returned from the Holy Land; and a truce was concluded on condition of paying the French king 20,000 merks, and putting four caſtles into his hands by way of ſecurity for the payment.—John, who had come over to England, met with ſtill leſs ſucceſs in his enterpriſes. He was only able to make himſelf maſter of the caſtles of Windſor and Wallingford; but when he came to London, and demanded the kingdom as heir to his brother, of whoſe death he pretended to have received certain intelligence, he was rejected by all the barons, and meaſures were taken to oppoſe and ſubdue him. The defence of the kingdom was ſo well provided for, that John, after ſome fruitleſs efforts, was obliged to conclude a truce with his opponents; and, before the expiration of it, he thought proper to retire to France, where he openly acknowledged his alliance with Philip.

All the efforts of Richard's enemies proved ineffectual to detain him in captivity. He was brought before the diet of the empire at Worms, where the emperor Henry brought againſt him a charge of many crimes and miſdemeanours: but to this the king replied with ſo much ſpirit and eloquence, that the German princes exclaimed loudly againſt the conduct of the emperor; the Pope threatened him with excommunication; and Henry, who had hearkened to the propoſals of the king of France and prince John, found that it would be impoſſible for him to execute his and their baſe purpoſes, and detain the king of England any longer in captivity. He therefore concluded a treaty with him for his ranſom; and agreed to reſtore him to his liberty for 150,000 merks, about L. 300,000 of our money, of which 100,000 merks were to be paid immediately, and 67 hoſtages delivered for the remainder.

132
Richard releaſed from captivity.

The money for the king's ranſom was moſt cheerfully raiſed by the Engliſh. The churches and monaſteries melted down their plate to the amount of 30,000 merks; the biſhops, abbots, and monks, paid a fourth part of their yearly rent; the parochial clergy contributed a tenth part of their tythes; and the requiſite ſum being thus collected, queen Eleanor and Walter archbiſhop of Rouen ſet out with it for Germany, paid the money to the emperor and duke of Auſtria at Mentz, delivered them hoſtages for the remainder, and freed Richard from his captivity. His eſcape was very critical. Henry had been detected in the aſſaſſination of the biſhop of Liege, and in an attempt of the like nature on the duke of Louvaine; and finding himſelf extremely obnoxious to the German princes on account of theſe odious practices, he had determined to ſeek ſupport from an alliance with the French king, and to detain Richard in perpetual captivity, notwithſtanding the ſum he had already received for his ranſom. He therefore gave orders that Richard ſhould be purſued and arreſted; but the king making all imaginable haſte, had already embarked at the mouth of the Scheldt, and was out of ſight of land when the emperor's meſſengers reached Antwerp. The king of France no ſooner heard of Richard's deliverance, than he wrote to John his confederate in theſe terms: "Take care of yourſelf: the devil is broke looſe."

133
Returns to England.

The king of England returned from captivity on the 20th of March 1194, and was received with the utmoſt joy by his ſubjects. He had been but one day landed, when his treacherous brother John came to make his ſubmiſſion. At the interceſſion of queen Eleanor he was received into favour. "I forgive him (ſaid the king), and hope I ſhall as eaſily forget his offences as he will my pardon." Richard was impatient to revenge himſelf on the king of France, and therefore inſtantly made war upon him. But though both kings were inflamed with the moſt violent reſentment againſt each other, they found it impoſſible to engage their powerful barons heartily in their cauſe. The war, therefore, produced no remarkable event; and, in 1195, was concluded by a truce for five years. On ſome ſlight occaſion it was ready to break out anew, when the pope's legate interpoſed, and a treaty was about to be concluded. King Richard in the mean time was wounded by an arrow at the ſiege of Chalus, a caſtle of Limoges. The wound was not in itſelf dangerous; but being unſkilfully treated, a mortification enſued, and the king expired on the 6th of April 1199, in the 10th year of his reign and 42d of his

134
His death.

his age. By his will he left the kingdom to his brother John, but diſtributed a fourth part of his treaſure among his ſervants.

135
John ſucceeds to the crown.

John ſucceeded to the crown of England without oppoſition, but ſoon found his affairs embarraſſed on the continent. The king of France, who, during the life of king Richard, had always ſupported the pretenſions of John, now gave a like ſupport to the claims of prince Arthur the ſon of Geoffrey, who, though only 12 years of age, promiſed to be deſerving of the kingdom. But in this matter the king of France ſhowed ſo much regard to his own intereſt, that Conſtantia the mother of the young prince, thinking that her ally deſigned to keep for himſelf the provinces which he pretended to conquer for Arthur, ſubmitted herſelf and her ſon to John, who detained them in Mans; and thus became undiſputed maſter of the whole empire.

136
His bad qualities.

The new king was weak, tyrannical, cruel, and treacherous. In ſhort, he ſeemed to be endowed with almoſt every bad quality that can fall to the ſhare of man. His conduct, therefore, ſoon rendered him univerſally odious. Imagining himſelf now ſecure on the ſide of France, he indulged his paſſion for Iſabella the daughter and heireſs of the count of Angouleme, with whom he was much enamoured. His queen, the heireſs of the family of Gloceſter, was ſtill alive; and Iſabella was married to the count de la Marche, tho', by reaſon of her youth, the marriage had not been conſummated. John perſuaded the count de Angouleme to carry off his daughter from her huſband; at the ſame time that he procured, under ſome pretence or other, a divorce from the queen. Thus he incurred the diſpleaſure of the pope, and alſo of the count de la Marche, and a powerful confederacy was formed againſt him.

As John had neither courage nor policy ſufficient to keep his barons in awe, he took a method for that purpoſe equally baſe and cruel. This was by hiring a ſet of ruffians, whom he called his *champions*, to fight duels with them, in caſes where they required to clear themſelves from any charge by fighting a duel, according to the cuſtom of thoſe times. Thus he propoſed to get rid of his refractory barons; but they, deſpiſing opponents who were ſo far below their rank, refuſed to fight with them, and a dangerous combination was formed among the barons againſt him.

137
Murders his nephew.

The murder of prince Arthur rendered John ſtill more generally deteſted. The young prince with his mother had fled to the court of France, where they were received with the greateſt kindneſs, and found their intereſts more vigorouſly ſupported than before. Their enterpriſes were attended with conſiderable ſucceſs, when Arthur himſelf had the misfortune to be taken priſoner. All the other captives were ſent to England; but the prince was ſhut up in the caſtle of Falaiſe, and from that time was never heard of. It was univerſally believed that John had murdered him with his own hand; and this inflamed the general reſentment againſt him to ſuch a degree, that he ſoon after loſt all his French provinces. In 1205, the duchy of Normandy itſelf was alſo conquered by Philip, and John was forced to fly with diſgrace to England.

The king was reſolved to wreak his vengeance upon the barons, who, he pretended, had deſerted his ſtandard in Normandy. For this reaſon, he levied large ſums on their eſtates; in order, as he ſaid, to undertake an expedition to the continent. This expedition, however, he ſeveral times capriciouſly deferred; and once having ventured out to ſea, returned again without making the ſmalleſt attempt. At laſt, he landed at Rochelle, and burnt the city of Angiers; but hearing that the enemy were preparing to oppoſe him, he returned without attempting any thing elſe.

This irreſolute and cowardly behaviour of John made him contemptible in the eyes of his ſubjects; but the Norman princes had ſo far extended the prerogatives of the Engliſh crown, that the barons, however diſcontented, durſt not yet attempt to change the form of government. John, by entering into a controverſy with the church, completed his ruin. The clergy, who for ſome time had acted as a community totally independent of the civil power, had their elections of each other generally confirmed by the pope, to whom alone they owned ſubjection. The election of archbiſhops, however, had been a ſubject of continual diſpute between the ſuffragan biſhops and the Auguſtine monks. In the mean time the archbiſhop of Canterbury died; and the Auguſtine monks, in a very private manner, elected Reginald, their ſuperior, in his place. The biſhops exclaimed againſt this election, as a manifeſt innovation of their privileges; and a furious theological conteſt was likely to enſue. John very imprudently took a ſide in this controverſy, and eſpouſed the cauſe of the ſuffragan biſhops; in conſequence of which, John de Grey biſhop of Norwich was choſen. The cauſe was appealed to Rome; and Pope Innocent III. ſeizing with avidity an opportunity of extending his power, commanded the monks to chooſe cardinal Stephen Langton, an Engliſhman, then at the court of Rome. The being able to nominate an archbiſhop of Canterbury (a perſon of almoſt equal authority with the king), was an acquiſition that would effectually give the court of Rome an unlimited authority over England. John therefore was reſolved not to ſubmit to this impoſition; but he had not judgment ſufficient to conduct him. He violently expelled the monks from their convent, and ſeized upon their revenues. The pope, perceiving from this abſurd conduct, that John was unequal to the taſk he had undertaken, after ſome intreaties, threatened to put the whole kingdom under an interdict. The prelates threw themſelves on their knees before the king, and in the moſt earneſt manner intreated him to avoid the reſentment of the holy tribunal, by receiving the primate, and reſtoring the monks to their convent. John, however, broke out into the moſt violent invectives. He ſwore by *God's teeth* (his uſual oath), that if the kingdom was put under an interdict, he would baniſh the whole body of the clergy, and confiſcate all their poſſeſſions. The pope at laſt, finding he might do it with ſafety, iſſued forth this terrible ſentence ſo much dreaded by the whole nation. A ſtop was immediately put to divine ſervice, and the adminiſtration of all the ſacraments except baptiſm. The church-doors were ſhut, and the images of the ſaints laid on the ground. The dead were refuſed Chriſtian burial; and were thrown into ditches and on the highways, without any funeral ſolemnity. Marriage was celebrated in the church-yards, and the people prohibited the uſe of meat as

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in times of public penance. They were debarred from all pleaſure; even from ſhaving their beards, ſaluting each other, or paying any regard to their apparel. The clergy deplored the unhappy ſtate of the nation in the moſt lamentable manner; while John, in revenge, impriſoned all their concubines, and treated the adherents of Langton with the utmoſt rigour.

The furious and imprudent efforts of John proved totally ineffectual. He had ſcarce a friend left in the whole nation; and therefore, in 1209, the pope denounced a ſentence of excommunication againſt him. This was ſoon followed by another ſtill more terrible; namely, the abſolving all the ſubjects of the king of England from their allegiance, and declaring every one to be excommunicated who had any commerce with him at his table, council, or even in private converſation. The king, rendered quite furious by theſe repeated indignities, wreaked his vengeance on his unhappy ſubjects, whoſe affections he ought rather to have attempted to conciliate. The pope, therefore, proceeded to execute the full meaſure of his wrath on this devoted prince, by giving away his kingdom to Philip of France. He publiſhed a cruſade all over Europe againſt king John; exhorting the nobility, the knights and men of every condition, to take up arms againſt him, and enliſt under the French banner. Philip was not leſs active on his part. He ſummoned all the vaſſals of the crown to attend him at Rouen; and having collected a fleet of 1700 veſſels, was ready, in 1213, to invade England.

The pope had now overſtretched his power; and had the Engliſh nation been governed by a prince of any degree of prudence or reſolution, the power of the clergy would in all probability have been totally broken. The people, however ſuperſtitious and ready to obey in matters of religion, could not tamely ſubmit to be given away by the pope as ſlaves from one maſter to another; and therefore this conſideration, added to the natural antipathy ſubſiſting between the French and Engliſh, put John, notwithſtanding all his offences, at the head of an army of 60,000 men. But the pope was too great a politician to ſuffer matters to be carried to extremities. He promiſed himſelf many more advantages from the ſubmiſſion of John than from an alliance with Philip; and therefore came over in perſon, or, according to ſome, ſent over his legate, to England, under pretence of conferring with the barons, but in reality to hold a conference with John. He there repreſented to this forlorn prince, the numbers of the enemy, the hatred of his own ſubjects, and the ſecret confederacy there was againſt him in England. He intimated, that there was but one way to ſecure him from the impending danger; namely, to put himſelf under the protection of the pope, who was a merciful father, and ſtill willing to receive a repenting ſinner. The abject and irreſolute ſpirit of John ſubmitted to this laſt piece of arrogance, and he took an oath to obey whatever the pope ſhould command. In conſequence of this oath, he took another, the moſt extraordinary mentioned in the records of hiſtory; and which, as it was taken while he commanded an army of 60,000 men, diſcovers a meanneſs of ſpirit almoſt incredible. The terms impoſed by it were expreſſed in the following words. "I John, by the grace of God king of England and lord of Ireland, in order to expiate my ſins, from my own free will, and the advice of my barons, *give* to the church of Rome, to pope Innocent and his ſucceſſors, the kingdom of England, and all other prerogatives of my crown. I will hereafter hold them as the pope's vaſſal. I will be faithful to God, to the church of Rome, to the pope *my maſter*, and his ſucceſſors legitimately elected. I promiſe to pay him a tribute of 1000 merks; to wit, 700 for the kingdom of England, and 300 for the kingdom of Ireland."

This oath was taken by the king before all the people, kneeling, and with his hands held up between thoſe of the legate. Having then agreed to reinſtate Langton in the primacy, he received the crown which he had been ſuppoſed to have forfeited; while the legate, to add to his former inſolence, trampled under his feet the tribute which John had conſented to pay. —The king of France was enraged at this behaviour of the pope; and reſolved to execute his project of conquering England, in ſpite of him and all his cenſures. His fleet, however, was attacked in their harbours by the Engliſh, who took 300 veſſels, and deſtroyed about 100 more; while Philip, finding it impoſſible to prevent the reſt from falling into the hands of the enemy, ſet fire to them himſelf, and thus was obliged to give up all hopes of ſucceſs.

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The barons attempt to reduce the prerogatives of the crown.

John being thus freed from all danger, continued to follow the ſame cruel and tyrannical meaſures which had hitherto rendered him odious to his ſubjects. His ſcandalous ſubjection to the clergy, now gave the barons an opportunity of exerting themſelves, in order to reduce the enormous prerogatives of the crown. Their deſigns were greatly facilitated by the concurrence of Langton the primate, who on all occaſions ſhowed a ſincere regard for the intereſts of the kingdom. At a ſynod of his prelates and clergy, convened in St Paul's, on pretence of examining into the loſſes of ſome biſhops who had been exiled by John, he privately conferred with a number of barons, to whom he expatiated upon the vices and injuſtice of their ſovereign. He ſhowed them a copy of Henry the firſt's charter; (being the only one in the kingdom, and which had been buried in the rubbiſh of an obſcure monaſtery). Langton exhorted the barons to inſiſt on a renewal of it; and this they ſolemnly ſwore to perform. The ſame agreement was afterwards renewed at a more numerous meeting of barons ſummoned by Langton at St Edmonſbury. Here it was reſolved, that at Chriſtmas they would prefer their common petition in a body; and in the mean time they ſeparated with a deſign to put themſelves in a poſture of defence, enliſt men, and fortify their caſtles. In the beginning of January 1215, they repaired to London, accoutred in their military garb and equipage, and preſented their petition to the king, alleging that he had promiſed to grant a confirmation of the laws of Edward the Confeſſor, at the time he was abſolved from his excommunication. John reſented their preſumption; and required a promiſe under their hands and ſeals, that they would never demand, or attempt to extort, ſuch privileges for the future. This they refuſed with ſuch unanimity and reſolution, that the king deſired time to conſider of their demands. He promiſed, that, at the feſtival of Eaſter, he would give a poſitive anſwer to their petition; and offered them the archbiſhop of Canterbury, the biſhop of

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Ely, and the earl mareſchal, as ſureties for fulfilling his engagements.

The barons accepted of his ſecurities, and departed peaceably; but John had no deſign of complying with their deſires. He had recourſe to the clergy, whoſe power he had ſeen and felt in ſo many inſtances. He courted their favour, by granting them a charter eſtabliſhing all thoſe rights of which they were already in the poſſeſſion, and which he now pretended to confirm when he had not the liberty to refuſe. To ingratiate himſelf ſtill farther with this body, he took the croſs, and appealed to the pope againſt the uſurpation of the barons. The pope wrote letters to England, reproaching the primate and biſhops with favouring theſe diſſenſions; and commanded them to promote peace between the two parties. He exhorted the barons to conciliate the king, not with menaces, but with humble intreaties; and promiſed, upon their obedience, to interpoſe his own authority in favour of ſuch of their petitions as he ſhould find to be juſt. At the ſame time he annulled their aſſociation, and forbad them to enter into any confederacy for the future.

The barons paid no regard to the pope's remonſtrances; knowing that the fulminations of the court of Rome would be of little avail, unleſs they were ſeconded by the clergy of England. After waiting till Eaſter, when the king promiſed to return them an anſwer, they met by agreement at Stamford. There they aſſembled a force of above 2000 knights, and a prodigious number of foot. Thence they marched to Brackley, about 15 miles from Oxford, the place where the court then reſided. John, hearing of their approach, ſent the archbiſhop of Canterbury, the earl of Pembroke, and others of his council, to know the particulars of their requeſt, and what thoſe liberties were which they ſo much importuned him to grant. The barons delivered a ſchedule containing the chief articles of their demands, founded on the charters of Henry and Edward; but which were in the higheſt degree diſpleaſing to the king. He burſt into a furious paſſion, aſked the barons why they did not alſo demand his kingdom, and ſwore that he would never comply with ſuch exorbitant demands. The confederates then choſe Robert Fitzwalter for their general; whom they dignified with the title of "Mareſchal of the army of God and of the holy church." They laid ſiege to Northampton, took Bedford, and were joyfully received into London. They wrote letters to all the nobility and gentry who had not yet declared in their favour, threatening their eſtates with devaſtation in caſe of refuſal or delay.

In the mean time the king was left at a place called *Odiham* in Surrey, attended only by ſeven knights. He vainly endeavoured to avert the ſtorm by the mediation of his biſhops and miniſters. He appealed to Langton againſt the barons, not ſuſpecting that he was engaged in the confederacy; and deſired him to fulminate the church-cenſures againſt thoſe who had made war upon their lawful prince. Langton declared that he would paſs no cenſure where he found no delinquent, but ſaid, that much might be done if the king would diſmiſs ſome foreign auxiliaries which he had lately brought over. Upon this John diſbanded a great body of Germans and Flemings whom he had hitherto retained in his ſervice, and Langton refuſed to excommunicate a ſingle baron. The king, being now quite defenceleſs, was obliged at laſt to comply with the demands of his ſubjects. A conference was accordingly appointed, and all things were adjuſted for this moſt important treaty.

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The king's commiſſioners met the barons at a place called *Runimede*, between Staines and Windſor; and which is yet held in reverence as the ſpot where the ſtandard of freedom was firſt erected in England. Here the king ſigned the charter called *Magna Charta;* which continues in force to this day, and is ſtill regarded as the great bulwark of Britiſh liberty. See *Magna Charta.*

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This charter, however, at the time that it was made, ſecured liberty to the clergy, barons, and gentlemen, much more than to the bulk of the people, who did not for a long time obtain any privileges of importance. Freedom of elections was ſecured to the clergy; and it was determined, that fines on them for any offence, ſhould be laid on in proportion to their eſtates, and not the value of their benefices. The privileges ſecured to the barons were, either abatements in the rigour of the feudal laws, or relief from arbitrary and ambiguous deciſions before the courts. It was alſo decreed, that barons ſhould recover the lands of their vaſſals, even though forfeited by felony, after having been in the poſſeſſion of the crown for a year and a day; and no tax was to be impoſed without conſent of the great council of the nation, excepting in caſe of the captivity of the king, the knighting of his eldeſt ſon, or marrying his eldeſt daughter. No land belonging to any baron was to be ſeized for a crown debt, unleſs the poſſeſſor had not perſonal property enough to pay it; neither was any vaſſal to be allowed to ſell ſo much of his land as to incapacitate him from performing the neceſſary ſervice to his lord. It was alſo determined, that when the great council of the nation was called, the prelates, earls, and barons, ſhould be ſummoned by a particular writ, and the leſſer barons ſhould receive a ſummons from the ſheriff. In favour of the people it was ſtipulated, that they ſhould have from the barons all the immunities and privileges granted by the king to the former. Merchants were to be allowed to carry on their buſineſs without any arbitrary tolls or impoſitions, and to go out of the kingdom and return at pleaſure. The goods of every freeman were to be diſpoſed of according to his will; or if he died inteſtate, the neareſt heir ſhould ſucceed him. No carts, horſes, or wood, were to be taken by the crown officers without the conſent of the owner. The king's courts were to be ſtationary, and no delay to be made in doing juſtice to every one; no freeman ſhould be taken or impriſoned, diſpoſſeſſed of his free tenement, outlawed or baniſhed, unleſs by the legal judgment of his peers, &c. It was likewiſe ſtipulated, that London ſhould remain in the hands of the barons, and the tower be conſigned to the primate, till the 15th of Auguſt following; or till the articles of the charter ſhould be fulfilled To give the more ſecurity for this, the king allowed them to chooſe 25 of their own number, to whoſe authority no limits were ſet either in extent or duration. If any complaint were made of a violation of the charter, either by the king or his officers, any four of the barons might admoniſh the king to redreſs the grievance; and if ſatisfaction were not obtained,

obtained, they might aſſemble the whole council of 25; and they, in conjunction with the great council, were empowered to compel him to fulfil the charter. In caſe of his reſiſtance, they had liberty to levy war againſt him, attack his caſtles, and uſe every kind of violence, except againſt his perſon, or thoſe of the queen or children. All men throughout the kingdom were bound, under the penalty of confiſcation, to ſwear obedience to the 25 barons; and the freeholders of each county were to chooſe 12 knights, whoſe buſineſs it was to report ſuch evil cuſtoms as ought to be redreſſed in terms of Magna Charta.

But although John had thus obliged himſelf, by writing, to allow liberty to his ſubjects, he had no mind that they ſhould enjoy it in reality. The ſenſe of his ſubjection to his own vaſſals ſunk deep in his mind. He became ſullen, ſilent, and reſerved. He ſhunned the ſociety of his former friends; and retired into the Iſle of Wight, as if to hide his diſgrace in ſolitude; but, in reality, to meditate revenge againſt the barons. He ſent to the continent to enliſt a large body of mercenary troops, and made complaints to the pope of the inſurrections of the barons againſt him. The pontiff very warmly eſpouſed his cauſe; a bull was ſent over, annulling the whole charter; and at the ſame time the foreign troops arriving, the king once more found himſelf in a condition to demand his own terms from his ſubjects.

The barons had made no preparations for war, not ſuſpecting the introduction of a foreign army. The king, therefore, was for ſome time undiſputed maſter of the field, and the moſt horrid cruelties were committed by his army. The nobility who had been moſt active in procuring the great charter fled with their families to Scotland, where they obtained the protection of king Alexander by doing homage to him. The barons being totally unable to raiſe an army capable of contending with that of John, applied to their old enemy Philip of France, offering to acknowledge his eldeſt ſon Louis for their ſovereign, on condition of his protecting them from the fury of John and his mercenaries. The French king accepted their propoſal with joy; and twenty-five hoſtages which he demanded being ſent over, began to make the moſt diligent preparations for this expedition, regardleſs of the menaces of the pope, who threatened him with excommunication, and actually excommunicated his ſon Louis ſome time after.

The firſt troops who came to the aſſiſtance of the barons, were only a body of 7000 men; but, ſoon after, Louis with a powerful army landed at Sandwich. The firſt effect of this invaſion was, that moſt of John's foreign troops deſerted, refuſing to ſerve againſt the heir of their monarchy. Many conſiderable noblemen alſo deſerted his cauſe, and Louis daily gained ground. This prince advanced to London, where the barons and burghers did him homage, and took the oath of allegiance, after he had ſworn to confirm the liberties and privileges of the people. His imprudence, however, in preferring on all occaſions his French ſubjects to the Engliſh, ſoon excited a jealouſy againſt him, which proved very prejudicial to his cauſe. This jealouſy was greatly increaſed by the death-bed confeſſion of the count de Melun, one of his courtiers, who declared to thoſe about him, that it was Louis's deſign to exterminate the Engliſh barons as traitors, and to beſtow their dignities and eſtates upon his French ſubjects, on whoſe fidelity he could more ſafely rely. This cauſed a conſiderable deſertion among Louis's party: ſo that John once more found himſelf in a condition to make an effort for his crown. He reſolved to penetrate into the heart of the kingdom; and, for this purpoſe, he departed from Lynn, and took the road towards Lincolnſhire at the head of a great body of troops. His road lay along the ſhore, which was overflowed at high water; but the king, not being appriſed of this, or being ignorant of the tides of the place, loſt all his carriages, treaſure, and baggage by their influx. He himſelf eſcaped with the utmoſt difficulty, and arrived at the abbey of Swinſtead; where his grief for the loſs he had ſuſtained, and the diſtracted ſtate of his affairs, threw him into a fever, which ſoon appeared to be attended with fatal ſymptoms. He died at Newark in the year 1216, the 51ſt of his age, and 18th of his reign. He left two legitimate ſons: Henry, who ſucceeded him on the throne, and was about nine years of age; and Richard, who was about ſeven. He left alſo three daughters; Jane, married to Alexander king of Scotland; Eleanor, married to the Earl of Pembroke; and Iſabella, married to the emperor Frederic II.

147
Death of king John.

When John died, the Earl of Pembroke was mareſchal of England. By this office he was at the head of the army, and of conſequence, in times of ſuch turbulence, at the head of the ſtate. He was a nobleman of great honour and fidelity, and had continued faithful to John in his greateſt reverſes of fortune. He now determined to ſupport the authority of the infant prince Henry; and therefore carried him immediately to Glouceſter, where the ceremony of coronation was performed, in the preſence of Gualo the legate and a very few noblemen, by the biſhops of Wincheſter and Bath. The young prince was obliged to ſwear fealty to the pope, and renew the homage which his father had done for the kingdom; after which the Earl of Pembroke was choſen protector.

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Henry III.

149
He grants new charter.

Till the king arrived at the years of maturity, the tranſactions of his reign can only be conſidered as the conſequences of the diſpoſition of his tutors. Pembroke cauſed him grant a new charter of liberties, conſiſting of the conceſſions extorted from John, with ſome alterations; and the next year it was renewed, with the addition of ſome other articles. Thus theſe famous charters were brought very nearly to the ſhape in which they have ever ſince ſtood; and they were, during many generations, eſteemed the moſt ſacred rampart to national liberty and independence. As they ſecured the rights of all orders of men, they were anxiouſly defended by all, and became in a manner the baſis of the Engliſh monarchy, and a kind of original contract, which both limited the authority of the king, and enſured the conditional allegiance of his ſubjects. Though often violated, they were ſtill claimed and recalled by the nobility and people; and as no precedents were ſuppoſed valid that infringed them, they rather acquired, than loſt, authority, from the frequent attempts made againſt them, in ſeveral ages, by regal and arbitrary power.

Theſe charters were made uſe of by Pembroke as arguments to draw off the malecontent barons from their allegiance to Louis. He repreſented to them, that, whatever jealouſy they might have entertained againſt the late king, a young prince, the lineal heir of their ancient monarchs, had now ſucceeded to the throne, without ſucceeding either to the reſentments or principles of his predeceſſor: That the deſperate expedient, which they had employed, of calling in a foreign potentate, had, happily for them, as well as for the nation, failed of entire ſucceſs; and it was ſtill in their power, by a quick return to their duty, to reſtore the independence of the kingdom, and to ſecure that liberty for which they ſo zealouſly contended: That, as all paſt offences of the barons were now buried in oblivion, they ought, on their part, to forget their complaints againſt their late ſovereign; who, if he had been anywiſe blameable in his conduct, had left to his ſon the ſalutary warning to avoid his paths, which had led to ſuch fatal extremities: And that, having now obtained a charter for their liberties, it was their intereſt to ſhow, by their conduct, that that acquiſition was not incompatible with their allegiance; and that the rights of the king and people, ſo far from being hoſtile and oppoſite, might mutually ſupport and ſuſtain each other.

150
Decline of prince Louis's party.

Theſe conſiderations, enforced by Pembroke's known character of conſtancy and fidelity, had a very great influence on the barons. Moſt of them began to negociate with him, and many actually returned to their duty. At the ſame time Louis continued to diſguſt thoſe of his own party by the preference which he viſibly gave to the French. Though he went over to France, therefore, and brought freſh ſuccours from thence, he found that his party was greatly weaker than before, by the deſertion of his Engliſh confederates; and that the death of king John had, contrary to his expectations, occaſioned the total ruin of his affairs. In a ſhort time Pembroke was ſo much ſtrengthened by deſerters from Louis's party, that he ventured to inveſt Mount-Sorel; though upon the approach of the count de Perche with the French army, he deſiſted from that enterpriſe. The French general immediately marched to Lincoln; and, being admitted into the town, laid ſiege to the caſtle, and ſoon reduced it to extremity. Pembroke ſummoned his forces from every quarter, in order to relieve this important place; and he appeared ſo much ſuperior to the French, that they ſhut themſelves up within the city, reſolving to take ſhelter there. But the garriſon of the caſtle, having received a ſtrong reinforcement, made a vigorous ſally upon the beſiegers, while the Engliſh army aſſaulted them from without. The French army was totally routed; the count de Perche with only two perſons more were killed; but many of the chief commanders, and about 400 knights, were made priſoners. On the news of this fatal event, Louis raiſed the ſiege of Dover, and retired to London; where he received intelligence of a new diſaſter, which put an end to all his hopes. A French fleet, which carried a ſtrong reinforcement, had appeared on the coaſt of Kent; where they were attacked and repulſed with conſiderable loſs, by Philip D'Albiney. He is ſaid to have gained the victory by the following ſtratagem. Having got the wind of the French, he came down upon them with violence; and throwing on their faces a great quantity of quicklime, which he purpoſely carried on board, they were ſo blinded that they were diſabled from defending themſelves. This misfortune ſo diſcouraged the barons who yet adhered to Louis, that they came from every quarter to make their ſubmiſſion to Pembroke; and Louis himſelf, finding his affairs totally deſperate, was glad to make his eſcape from a country where every thing was become hoſtile to him. He therefore concluded a peace with the Protector; promiſed to evacuate the kingdom; and only ſtipulated, in return, an indemnity to his adherents, and a reſtitution of their honours and fortunes, together with the free and equal enjoyment of thoſe liberties which had been granted to the reſt of the nation.

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When the king grew up, he was found to be very unfit for the government of ſuch a turbulent people as the Engliſh at that time were. Though his temper was mild and humane, he was alſo very weak, fickle, and irreſolute. He diſguſted the people by the careſſes he beſtowed on foreigners; and this diſguſt roſe once to ſuch a height, that the barons refuſed to aſſemble in the general council of the nation, or parliament, at his deſire. When commanded to do ſo, they ſent a meſſage to Henry, deſiring him to diſmiſs his foreigners; otherwiſe they would drive both him and them out of the kingdom, and put the crown on the head of one who was more worthy to wear it. The facility of Henry's temper alſo induced him to heap riches upon his foreign favourites in a manner which he could by no means afford: this often brought him into very great ſtraits; and to relieve himſelf, he was obliged to have recourſe to many arbitrary meaſures, which he could not otherwiſe have choſen. Nothing, however, of very great moment happened till the year 1255, when the Pope found means to embark Henry in a ſcheme for the conqueſt of Naples, or Sicily on this ſide the Fare, as it was called; an enterpriſe which not only brought much diſhonour on the king, but involved him for ſome years in very great expence and trouble. The court of Rome ſome time before had reduced the kingdom of Sicily to the ſame ſtate of feudal vaſſalage which ſhe pretended to exerciſe over England; but Mainfroy, an uſurper, under pretence of governing the kingdom for the lawful heir, had ſeized the crown, and was reſolved to reject the Pope's authority. As the Pope found that his own force alone was not ſufficient to gain his point, he had recourſe to Richard the king of England's brother, who had been created Earl of Cornwall, and had ſuch talents for amaſſing money, that he was reckoned the richeſt prince in Chriſtendom. To him the Pope offered the kingdom of Sicily, upon the ſingle condition of his conquering it from the uſurper. Richard was too wiſe to accept this offer; upon which the Pope applied to Henry, and offered him the crown of Sicily for his ſecond ſon Edmund. Henry, dazzled by this propoſal, without reflecting on the conſequences, or without conſulting his brother or the parliament, gave the Pope unlimited credit to expend whatever ſums he thought neceſſary for completing the conqueſt of Sicily. In conſequence of this unlimited grant, his holineſs determined to exert his apoſtolical authority to the utmoſt, in extorting money from the Engliſh. A cruſade was publiſhed, requiring every one who had taken the croſs againſt the infidels, or even vowed to advance money for that purpoſe, to ſupport the war againſt Mainfroy, whom he accuſed as being a more terrible enemy

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enemy to the Chriſtian faith than any Saracen. A tenth on all the eccleſiaſtical benefices in England was levied for three years; and orders were given to excommunicate the biſhops who did not make punctual payment. A grant was made to the king of the goods of inteſtate clergymen, as well as of the revenues of vacant benefices and thoſe of non-reſidents. Theſe taxations, however grievous, were ſubmitted to with little murmuring; but another ſuggeſted by the biſhop of Hereford excited the moſt violent clamours. This prelate, who at that time reſided at the court of Rome, drew bills on all the abbots and biſhops of the kingdom, to the amount of no leſs than 150,540 marks, which he granted to Italian merchants in conſideration of the money they had advanced or pretended to advance for the ſupport of the Sicilian war. As it was apprehended that the Engliſh clergy would not eaſily ſubmit to ſuch an extraordinary demand, a commiſſion was given to Ruſtand, the Pope's legate, to uſe his authority. An aſſembly of the prelates and abbots was accordingly ſummoned; who, on hearing the propoſal ſanctified with the names both of the Pope and King, were ſtruck with the utmoſt ſurpriſe and indignation. A violent altercation took place; during which the legate told them, that all eccleſiaſtical benefices were the property of the Pope, and that he might diſpoſe of them as he pleaſed. The affair ended, however, in the ſubmiſſion of the clergy: but the barons ſtill continued refractory, and for ſome time anſwered the king's demands of ſupplies with expoſtulations; urging the king's partiality to foreigners. and the various injuries the nation had ſuſtained from the ſervants of the crown. The great council of the nation, which had lately obtained the name of *parliament*, was therefore diſſolved, and another called, but with as little ſucceſs as before. The king, however, had involved himſelf in ſo much debt, that a large ſupply was become abſolutely neceſſary; and as that could by no means be obtained from parliament, he was now reduced to the humiliating expedient of going about among ſuch of his ſubjects as he thought moſt attached to him, and begging aſſiſtance from them at their own houſes. At length his barons, perceiving the exigencies to which he was reduced, ſeemed willing to afford him aid; and, upon his promiſing to grant them a plenary redreſs of grievances, a very liberal ſupply was obtained, for which he renewed their charter with more than uſual ſolemnity. All the prelates and abbots were aſſembled with burning tapers in their hands; the magna charta was read in their preſence; and they denounced ſentence of excommunication upon all who ſhould infringe upon its deciſions. They then put out their tapers on the ground, and exclaimed, "May every ſoul that proves falſe to this agreement ſo ſtink and corrupt in hell." The king ſubjoined, "So help me God, I will inviolably keep all theſe things, as I am a man, as I am a Chriſtian, as I am a knight, and as I am a king crowned and anointed."

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No ſooner had the king received the ſupplies of which he ſtood ſo much in need, than he forgot all his engagements, put his confidence entirely in foreign counſellors, and evaded or broke through in numberleſs inſtances the charters he had given. This conduct rendered him ſo obnoxious to the barons, that Simon Mountfort Earl of Leiceſter, a man of a very violent and ambitious temper, determined to attempt an innovation in the government. He formed a powerful confederacy againſt the king, and the deſigns of the conſpirators were effectually put in execution in the year 1258. Henry had ſummoned a parliament in expectation of receiving ſupplies for his Sicilian project; when the barons appeared in the hall, clad in complete armour, with their ſwords by their ſides. The king, ſtruck with this unuſual appearance, aſked them what was their purpoſe, and whether they pretended to make him their priſoner? Roger Bigod, Earl Mareſchal, anſwered in name of the reſt, that he was not their priſoner; that they even intended to grant him large ſupplies, in order to fix his ſon on the throne of Sicily; that they only expected ſome return for this expence and ſervice; and that as the king had frequently made ſubmiſſions to the parliament, had acknowledged his paſt errors, and had ſtill allowed himſelf to be carried into the ſame path, which gave them ſuch reaſon of complaint, he muſt now yield to more ſtrict regulations, and confer authority on thoſe who were able and willing to redreſs the public grievances. Henry inſtantly aſſured them of his intentions to grant them all poſſible ſatisfaction; and for that purpoſe ſummoned another parliament at Oxford, to digeſt the new plan of government, and to elect proper perſons who were to be entruſted with the chief authority. This aſſembly, afterwards called the *mad parliament*, went very expeditiouſly to work on the buſineſs of reformation. Twenty-four barons were appointed, with ſupreme authority, to reform the abuſes of the ſtate; and Leiceſter was placed at their head. Their firſt ſtep was to order four knights to be choſen out of each county, who ſhould examine into the ſtate of their reſpective conſtituents, and ſhould attend at the enſuing parliament to give information of their complaints. They ordained that three ſeſſions of parliament ſhould be regularly held every year; that a new high ſheriff ſhould be elected annually; that no wards nor caſtles ſhould be entruſted to foreigners, no new foreſts made, nor the revenues of any counties let to farm.

155
Bad conduct of the new rulers.

Theſe conſtitutions were ſo juſt, that ſome of them remain to this day. But the parliament having once obtained the ſovereign power, took care not to part with it again. They not only protracted the time of their ſitting under various pretences; but at laſt had the effrontery to impoſe an oath upon every individual of the nation, declaring an implicit obedience to all the ſtatutes executed or to be yet executed by the barons who were thus appointed as rulers. They not only abridged the authority of the king, but the efficacy of parliament alſo; giving up to 12 perſons the whole parliamentary power between each ſeſſion.—— Their uſurpations were firſt oppoſed by the knights of the ſhire, whom they themſelves had appointed. Theſe had for ſome time begun to be regularly aſſembled in a ſeparate houſe, to conſider of the national grievances; the firſt of which was the conduct of the 24 rulers. They repreſented, that though the king had performed all that was required of him, the barons had hitherto done nothing on their part that ſhowed an equal regard for the people; that their own intereſt and power ſeemed the only aim of all their decrees; and they even called upon the king's eldeſt ſon prince

Edward to interpoſe his authority, and ſave the ſinking nation.

156
Oppoſed by prince Edward.

The prince was at this time about 22 years of age, and by his active and reſolute conduct had inſpired the nation with great hopes. He told thoſe who made the application to him, that he had ſworn to the late conſtitutions; and, on that account, though they were contrary to his own private opinions, he was reſolved not to infringe them. At the ſame time, however, he ſent a meſſage to the barons, requiring them to bring their undertaking to an end, or otherwiſe to expect the moſt vigorous reſiſtance to their uſurpations. On this the barons were obliged to publiſh a new code of laws, which, though it contained ſcarce any thing material, yet, it was ſuppoſed, would for a while dazzle the eyes of the people, until they could take meaſures to eſtabliſh their authority upon ſurer foundations. In this manner, under various pretences, they continued their power for three years; while the whole nation loudly condemned their treachery, and the Pope himſelf at laſt abſolved the king and his ſubjects from the oath they had taken to obey their injunctions. Soon after this, a parliament was called, and the king reinſtated in his former authority. The barons were obliged to ſubmit for a time; but the Earl of Leiceſter having joined the Welſh, who at this time made an irruption into England, the kingdom was reduced to the moſt deplorable ſituation. The puſillanimity of the king prevented any proper or judicious method from being purſued for extricating the people from their diſtreſſes; and at laſt a treaty was concluded with the barons on the moſt diſadvantageous terms that can be imagined. They were reſtored to the ſovereignty of the kingdom, took poſſeſſion of all the royal caſtles and fortreſſes, and even named the officers of the king's houſehold. They ſummoned a parliament to meet at Oxford, in order more fully to ſettle the plan of government; and by this aſſembly it was enacted, that the authority of the 24 barons ſhould continue not only during the life of king Henry, but alſo during that of prince Edward.

157
Who is defeated and taken priſoner, with the king and his brother.

Theſe ſcandalous conditions would have been eaſily complied with by king Henry; but they were utterly rejected by prince Edward, and a civil war immediately enſued. The prince was at firſt ſucceſsful; but, through his impetuoſity, occaſioned the loſs of a great battle, in which his father and uncle were taken priſoners, and he himſelf was obliged ſoon after to ſurrender to the earl of Leiceſter. The king was now reduced to the moſt deplorable ſituation. His partiſans were totally diſarmed, while thoſe of the earl of Leiceſter ſtill kept themſelves in an offenſive poſture. Leiceſter ſeized the eſtates of no fewer than 18 barons; engroſſed to himſelf the ranſom of all the priſoners; monopolized the ſale of wool to foreign markets; and at laſt ordained that all power ſhould be exerciſed by nine perſons, who were to be choſen by three others, or the majority of them; and theſe three were the earl of Leiceſter himſelf, the Earl of Gloceſter, and the biſhop of Chicheſter.

148
Firſt Houſe of Commons.

The miſerable ſituation to which the kingdom was now reduced, proved at laſt the means of ſettling the government on a more proper foundation. Leiceſter, in order to ſecure himſelf, was obliged to have recourſe to an aid, till now, entirely unknown in England, namely, that of the body of the people. He called a parliament, where, beſides the barons of his own party, and ſeveral eccleſiaſtics who were not proper tenants of the crown, he ordered returns to be made of two knights from every ſhire; and alſo deputies from the boroughs, which had been hitherto conſidered as too inconſiderable to be allowed any ſhare in the legiſlation. This parliament was called on the 20th of January 1265: and here we find the firſt outline of an Engliſh Houſe of Commons; an inſtitution which has ever ſince been conſidered as the bulwark of Britiſh liberty.

The new parliament was far from being ſo compliant to Leiceſter as he had deſired or expected. Many of the barons who had hitherto ſtedfaſtly adhered to his party, were diſguſted with his boundleſs ambition; and the people, who found that a change of maſters was not a change from miſery to happineſs, began to wiſh for the re-eſtabliſhment of royal authority. Leiceſter at laſt, to make a merit of what he could not prevent, releaſed prince Edward from his confinement, and had him introduced at Weſtminſter-hall, where his freedom was confirmed by the unanimous voice of the barons. But though Leiceſter had all the popularity of reſtoring the prince, he was yet politic enough to keep him guarded by his emiſſaries, who watched all his actions. At laſt, however, he found means to make his eſcape in the following manner. The Duke of Gloceſter, being diſguſted with Leiceſter, retired from court, and went to his eſtates on the borders of Wales. His antagoniſt purſued him thither; and to give the greater authority to his arms, carried the king and prince of Wales along with him. This furniſhed young Edward with the opportunity he had ſo long deſired. Being furniſhed by the Earl of Gloceſter with an horſe of extraordinary ſwiftneſs, he took leave of his attendants, who were in fact his guards, but were not able to come up with him. They purſued him, however, for ſome time; but the appearance of a body of troops belonging to Gloceſter ſoon put an end to their purſuit.

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The prince no ſooner recovered his liberty, than the royaliſts joined him from all quarters, and an army was ſoon procured which Leiceſter could not withſtand. This nobleman now found himſelf in a remote quarter of the kingdom; ſurrounded by his enemies; and debarred from all communication with his friends by the river Severn, whoſe bridges Edward had broken down. In this extremity, he wrote to his ſon to haſten to his aſſiſtance from London, with a conſiderable army which he had under his command. With this view his ſon advanced to Kenilworth; but here he was ſurpriſed, and his army entirely diſperſed by prince Edward. The young prince, immediately after this victory, advanced againſt Leiceſter himſelf; who, ignorant of the fate of his ſon's army, had paſſed the Severn in boats. He was by no means able to cope with the royaliſts; his men being inferior both in numbers and reſolution to their antagoniſts. His army was defeated with great ſlaughter. Leiceſter himſelf was ſlain, though he called out for quarter, together with his eldeſt ſon Henry, and about 160 knights and other gentlemen. The old king had been purpoſely placed by the rebels in the front of the battle, where he was wounded, and in great danger of being killed; but, crying out, "I am Henry of Wincheſter your king," he was ſaved and put in a place of ſecurity by his ſon, who

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who had flown to his aſſiſtance. The body of Leiceſter being found among the dead, was barbarouſly mangled by one Roger Mortimer; and then ſent to his widow, as a teſtimony of the royal party's barbarity and ſucceſs.

This victory, gained at Eveſham, proved deciſive in favour of the royal party. Almoſt all the caſtles, garriſoned by the barons, haſtened to make their ſubmiſſions, and opened their gates to the king. The Iſle of Axholme alone, and that of Ely, truſting to the ſtrength of their ſituation, ventured to make reſiſtance; but were at laſt reduced, as well as the caſtle of Dover, by the valour and activity of prince Edward. Adam de Gourdon, a courageous baron, maintained himſelf ſome time in the foreſts of Hampſhire, committing depredations in the neighbourhood; and obliged the prince to lead a body of troops into that country againſt him. Edward attacked the camp of the rebels; and being tranſported by the ardour of action, leaped over the trench with a few followers, and encountered Gourdon himſelf in ſingle combat. The victory was long diſputed between theſe two valiant combatants; but ended at laſt in the prince's favour, who wounded his antagoniſt, threw him from his horſe, and took him priſoner. He not only granted him his life; but introduced him that very night to the queen at Guildford, procured his pardon, and was ever after faithfully ſerved by him.

In 1271, prince Edward, having ſettled the affairs of the kingdom, undertook an expedition to the Holy Land, where he ſignalized himſelf by many acts of valour. The king's health declined viſibly after the departure of his ſon; and at laſt, worn out with cares and the infirmities of age, he expired at St Edmonſbury on the 16th of November 1272, in the 64th year of his age and the 56th of his reign.

Prince Edward had reached Sicily in his return from the Holy Land, when he received an account of his father's death; at which he expreſſed much concern. As he knew that England was at that time in a ſtate of perfect tranquillity, he was in no haſte to return, but ſpent near a year in France before he made his appearance in England. He was received by his ſubjects with the utmoſt joy, and crowned at Weſtminſter by Robert archbiſhop of Canterbury on the 19th of Auguſt 1274. He immediately applied himſelf to the correcting of theſe diſorders which the civil commotions. and weak adminiſtration of his father, had introduced. A ſyſtem of ſtrict juſtice, bordering on ſeverity, was introduced and kept up thro' the whole of this reign. The Jews were the only part of his ſubjects whom Edward oppreſſed. Many arbitrary taxes were levied upon them; 280 of them were hanged at once for adulterating the coin; the goods of the reſt were confiſcated, and all of them baniſhed the kingdom.

In 1276, the king undertook an expedition againſt Lewellyn prince of Wales, who had refuſed to do homage for his crown. The conqueſt of that country was not fully accompliſhed till the year 1283; after which the principality of Wales was annexed to the crown of England, and thenceforth gave a title to the king's eldeſt ſon *.—In 1286, the ſettlement of Wales appeared ſo complete, that the king went abroad in order to make peace between Alfonſo king of Arragon and Philip le Bel king of France, who had a difference about the kingdom of Sicily. He ſucceeded in his negociations; but, ſtaying abroad three years, he found that many diſorders had been introduced in his abſence. Many inſtances of robbery and violence had broke out in all parts of England; but the corruption of the judges, by which the fountains of juſtice were poiſoned, was of ſtill more dangerous conſequence. Edward, in order to remedy this prevailing abuſe, ſummoned a parliament, and brought the judges to a trial; where all of them except two, who were clergymen, were convicted of this flagrant iniquity, were fined, and depoſed from their office. The amount of the fines levied upon them is of itſelf a ſufficient proof of their guilt, being above 100,000 marks; an immenſe ſum in thoſe days, ſufficient to defray the expences of a war betwixt two great nations. The king afterwards made all the new judges ſwear that they would take no bribes; but the depoſing and fining the old ones was the more effectual remedy.

164
Attempts the conqueſt of Scotland.

In 1291, king Edward began to meditate the conqueſt of Scotland, which employed him during the reſt of his life; but which, though that kingdom was by him reduced to the greateſt diſtreſs, he was never able to accompliſh *. At the ſame time, he was engaged in expenſive conteſts with France; and theſe multiplied wars and preparations for war, by obliging him to have frequent recourſe to parliamentary ſupplies, became the remote cauſes of great and important changes in the government. The parliament was modelled into the form which has continued ever ſince. As a great part of the property of the kingdom, by the introduction of commerce and improvements in agriculture, was transferred from the barons to the lower claſs of people, ſo their conſent was thought neceſſary for raiſing the ſupplies. For this reaſon, the king iſſued writs to the ſheriffs, enjoining them to ſend to parliament, along with two knights of the ſhire, two deputies from each borough within their county; and theſe provided with ſufficient powers from their conſtituents to grant ſuch demands as they ſhould think reaſonable for the ſafety of the ſtate. The charges of theſe deputies were to be borne by the boroughs which ſent them; and ſo far were they from conſidering this deputation as an honour, that nothing could be more diſpleaſing to any borough than to be thus obliged to ſend a deputy, or to any individual than to be thus choſen. The authority of theſe commoners, however, increaſed through time. Their union gave them weight; and it became cuſtomary among them, in return for the ſupplies which they granted, to prefer petitions to the crown for the redreſs of thoſe grievances under which the nation was ſuppoſed to labour. The more the king's neceſſities increaſed, the more he found it neceſſary to give them an early redreſs; till, from requeſting, the commons proceeded to requiring; and having all the property of the nation, they by degrees began alſo to be poſſeſſed of the power

165
New models the parliament.

166
Dies, and is ſucceeded by Edw. II.

Edward I. died of a dyſentery at Carliſle on the 7th of July 1307, as he was leading a great army into Scotland, againſt the inhabitants of which he had vowed the moſt dreadful vengeance. He was ſucceeded by his ſon Edward II. whom he had charged with his dying breath to proſecute the war againſt Scotland, and never to deſiſt till he had finally ſubdued the king-

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* See *Scotland.*

kingdom. But the new king was of a very different diſpoſition from his father. The Scots gradually recovered their power; and in 1314 gave the Engliſh ſuch a terrible defeat at Bannockburn, that for many years no ſuperiority of numbers could encourage them to look the Scots in the face. See SCOTLAND.

167 Diſcontents of his ſubjects.

The reign of Edward II. affords no particulars of great moment. Being a prince of a weak underſtanding, though endued with no remarkable bad qualities, his reign was one continued ſeries of quarrels with his turbulent ſubjects. His favourites were the moſt general cauſes of diſcontent. The firſt of theſe was one Piers Gaveſton, the ſon of a Gaſcon knight of ſome diſtinction, who had honourably ſerved the late king, and who, in reward for his ſervices, had obtained an eſtabliſhment for his ſon in the family of the prince of Wales.—To be the favourite of any king whatever, is no doubt in itſelf a ſufficient offence to the reſt of the courtiers. Numberleſs faults were therefore found with Gaveſton by the Engliſh barons. When the king went over to France to eſpouſe the princeſs Iſabella, to whom he had been long contracted, Gaveſton was left guardian of the realm, with more ample powers than had uſually been conferred in ſuch a caſe. But when the queen, who was of an imperious and intriguing ſpirit, arrived, Gaveſton had the misfortune to fall under her diſpleaſure alſo, on account of the aſcendency he had acquired over the king. A conſpiracy was therefore ſoon formed againſt the favourite; at the head of which were, the queen, and the Earl of Lancaſter couſin-german to the king, and the moſt opulent and powerful nobleman in England. The king, unable to reſiſt ſuch a combination, was at laſt obliged to baniſh Gaveſton; but recalled him ſome time after. This was ſufficient to ſpread an alarm over the whole kingdom: a civil war enſued; and the nobility having got Gaveſton into their hands, ſoon freed themſelves of any farther apprehenſions from him, by putting him to death.

After the unfortunate defeat at Bannockburn, king Edward choſe a new favourite named *Hugh Le Deſpenſer*. He was a young man of a noble Engliſh family; ſome merit, and very engaging accompliſhments. His father was a perſon of a much more reſpectable character than the ſon; but the being admitted to a ſhare of king Edward's favour was a ſufficient crime. The king imprudently diſpoſſeſſed ſome lords of their eſtates, in order to beſtow them upon this favourite; and this was a ſufficient pretence for openly attacking both the father and ſon. The Earls of Lancaſter and Hereford flew to arms. Sentence was procured from parliament of perpetual exile againſt the two Spenſers, with a forfeiture of all their eſtates. At laſt the king took the field at the head of 30,000 men, and preſſed the Earl of Lancaſter ſo cloſely, that he had not time to collect his forces together; and, flying from one place to another, he was at laſt ſtopped in his way towards Scotland, and made priſoner. He was immediately condemned by a court-martial; and executed on an eminence near Pomfret, with circumſtances of the greateſt indignity.

Spenſer now triumphed for ſome time over his enemies; moſt of the forfeitures were ſeized for his uſe, and he is ſaid to have been guilty of many acts of rapine and injuſtice. But he was ſoon oppoſed by a more formidable enemy. Queen Iſabella fled to France, and refuſed to return to England till Spenſer was removed from the royal preſence, and baniſhed the kingdom. Thus ſhe made herſelf popular in England, where Spenſer was univerſally diſliked; and ſhe had the pleaſure of enjoying the company of a young nobleman named *Mortimer*, upon whom ſhe had lately placed her affections. The queen's court, therefore, became a ſanctuary for all the malecontents who were baniſhed their own country, or who choſe to come over. When ſhe thought matters were ripe for her purpoſe, ſhe ſet ſail from Dort harbour, accompanied by 3000 armed men. She landed without oppoſition on the coaſt of Suffolk, on the 24th of September 1326; and ſhe no ſooner appeared, than there ſeemed to be a general revolt in her favour. The unfortunate king found the ſpirit of diſloyalty ſpread over the whole kingdom. He had placed ſome dependence on the garriſon of Briſtol, which was under the command of the elder Spenſer: but they mutinied againſt their governor; and that unfortunate favourite was delivered up, and condemned by the tumultuous barons to the moſt ignominious death. He was hanged on a gibbet in his armour; his body was cut in pieces and thrown to the dogs; and his head was ſent to Wincheſter, where it was ſet on a pole, and expoſed to the inſults of the populace. Young Spenſer did not long ſurvive his father. He was taken, with ſome others who had followed the fortunes of the wretched king, in an obſcure convent in Wales. The queen had not patience to wait the formality of a trial; but ordered him to be immediately led forth before the inſulting populace, and ſeemed to take a ſavage pleaſure in beholding his diſtreſs. He was executed on a gibbet 50 feet high; his head was ſent to London, where it was received by the citizens with brutal triumph, and fixed on the bridge.

In the mean time the king, who hoped to find refuge in Wales, was quickly diſcovered, and delivered up to his adverſaries, who inſulted him in the groſſeſt manner. He was conducted to the capital amidſt the inſults and reproaches of the people, and confined in the tower. A charge was ſoon exhibited againſt him; in which no other crimes but his incapacity to govern, his indolence, his love of pleaſure, and his being ſwayed by evil counſellors, were objected againſt him. His depoſition, however, was quickly voted by parliament; he was aſſigned a penſion for his ſupport; his ſon Edward, a youth of 14, was choſen to ſucceed him, and the queen was appointed regent during the minority. The depoſed monarch did not long ſurvive the loſs of his crown. He was at firſt conſigned to the cuſtody of the Earl of Lancaſter; but this nobleman ſhowing ſome marks of reſpect and pity, he was taken out of his hands, and delivered over to the lords Berkeley, Mautravers, and Gournay, who were entruſted alternately, each for a month, with the charge of guarding him. While he was in Berkeley's cuſtody, he was ſtill uſed with ſome degree of humanity; but when the turn of Mautravers and Gournay came, every ſpecies of indignity was practiſed upon him, as if they had deſigned to accelerate his death by the bitterneſs of his ſufferings. It is reported, that one day when Ed-nd.

Edward was to be ſhaved, they ordered cold and dirty water to be brought from a ditch for that purpoſe; and when he deſired it to be changed, and was ſtill denied his requeſt, he burſt into tears and exclaimed, That in ſpite of their inſolence he would be ſhaved with clean and warm water. As his perſecutors, however, ſaw that his death might not arrive, even under every cruelty they could practiſe, and were daily afraid of a revolution in his favour, they determined to rid themſelves of their fears by deſtroying him at once. Mortimer, therefore, ſecretly gave orders to the two keepers, who were at his devotion, inſtantly to diſpatch the king; and theſe ruffians contrived to make the manner of his death as cruel and barbarous as poſſible. Taking advantage of Berkeley's ſickneſs, in whoſe cuſtody he then was, and who was thereby incapacitated from attending his charge, they came to Berkeley-caſtle, and put themſelves in poſſeſſion of the king's perſon. They threw him on a bed, and held him down with a table which they had placed over him. They then ran a horn pipe up his body, through which they conveyed a red-hot iron; and thus burnt his bowels without disfiguring his body. By this infernal contrivance they expected to have their crime concealed: but the horrid ſhrieks of the king, which were heard at a diſtance from the caſtle, gave a ſuſpicion of the murder; and the whole was ſoon after divulged by the confeſſion of one of the accomplices. Gournay and Mautravers were held in deteſtation by all mankind; and when the enſuing revolution deprived their protectors of power, they found it neceſſary to fly the kingdom. Gournay was afterwards ſeized at Marſeilles, delivered over to the ſeneſchal of Guienne, and put on board a ſhip with a view of carrying him over to England; but he was beheaded at ſea, by ſecret orders, as was ſuppoſed, of ſome nobles and prelates in England, anxious to prevent any diſcovery which he might make of his accomplices. Mautravers concealed himſelf for ſome years in Germany; but having found means of rendering ſome ſervices to Edward III. he ventured to approach his perſon, threw himſelf on his knees before him, and received a pardon.

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By the death of Edward II. the government fell entirely into the hands of the queen and her paramour Mortimer. The parliament, which raiſed young Edward to the throne, had indeed appointed 12 perſons as his privy-council, to direct the operations of government. Mortimer excluded himſelf, under a ſhow of moderation; but at the ſame time ſecretly influenced all the meaſures that came under their deliberation. As this influence began very ſoon to be perceived, and the queen's criminal attachment to Mortimer was univerſally known, theſe governors ſoon became very obnoxious to the people. The firſt ſtroke given to Mortimer's power was during an irruption of the Scots, when the favourite prevented the young king from attacking the enemy. Though it is very probable that the Engliſh army would have been deſtroyed by making an attack on an army ſituated in ſuch an advantageous poſt as the Scots at that time occupied, Mortimer incurred great blame on that account. He was accuſed of having allowed the Scots to make their eſcape; and the general diſguſt on this account was increaſed by his concluding a peace with that kingdom, wherein the Engliſh renounced all title to the ſovereignty of Scotland for the ſum of 30,000 marks. Soon after Mortimer ſeized and executed the earl of Kent, brother to the late king; who, ſuppoſing Edward II. to be ſtill alive, had formed a deſign of reinſtating him in his kingdom. The execution was ſo ſudden, that the young king had not time even to interpoſe in his behalf; and Mortimer ſoon after ſeized this nobleman's eſtate for his own uſe, as he did alſo the immenſe fortunes of the Spenſers.

England.

Edward, finding the power of Mortimer a continual reſtraint upon himſelf, reſolved to ſhake off an authority that was likewiſe grown odious to the whole nation. The queen and Mortimer had for ſome time choſen the caſtle of Nottingham for their reſidence. It was ſtrictly guarded, the gates were locked every night, and the keys carried to the queen. It was therefore agreed between the king and ſome of the barons, who ſecretly entered into his deſigns, to ſeize upon them in this fortreſs. Sir William Eland the governor was induced to admit them through a ſubterraneous paſſage, which had been formerly contrived for an outlet, but was now choked up with rubbiſh, and known only to one or two. Through this paſſage the noblemen in the king's intereſt entered the caſtle in the night-time; and Mortimer, without having it in his power to make any reſiſtance, was ſeized in an apartment adjoining to that of the queen. The parliament, which was then ſitting, condemned him, without either permitting him to make his defence, or examining a ſingle witneſs againſt him. He was hanged on a gibbet at a place called *Elmes*, about a mile from London. A ſimilar ſentence was paſſed againſt ſome of his adherents, particularly Gournay and Mautravers, who found an opportunity of eſcaping as above mentioned. The queen, who was perhaps the moſt culpable of the whole, was ſcreened by the dignity of her ſtation. She was, however, depoſed from all ſhare of power; and confined for life to the caſtle of Riſings, with a penſion of 3000 pounds a-year. From this confinement ſhe was never ſet free, though the king paid her an annual viſit of ceremony. She lived 25 years after her depoſition.

172
Mortimer
executed.

Edward III. proved the greateſt warrior that ever ſat on the Engliſh throne. He firſt attempted to raiſe Edward Baliol to the ſovereignty of Scotland; but this he found impoſſible fully to accompliſh. Edward next formed a project of invading and conquering France, to the ſovereignty of which he pretended a right. His firſt expectations were attended with ſo little ſucceſs, that on his return to England he found the nation very much diſcontented, and himſelf haraſſed by his numerous creditors without any ſufficient reſource for paying them. Being determined, however, not to bear any blame himſelf if he could throw it any where elſe, he took the firſt opportunity of wreaking his vengeance upon his ſubjects. Finding therefore the tower of London negligently guarded on his arrival, he impriſoned the conſtable and all his inferior officers, treating them with the greateſt ſeverity. He then fell upon the ſheriffs and collectors of the revenue, whom he diſmiſſed from their employments, and appointed an inquiry into their conduct to be made by perſons who, knowing the king's humour, were ſure to find every one guilty who came before them. The keeper of the privy-ſeal, the chief-juſtice, the mayor of London, the

173
Edward
invades
France unſucceſsfully.

174
His arbitrary behaviour on
his return.

the biſhops of Chicheſter and Litchfield, with the chancellor and treaſurer, were depoſed and impriſoned.

175
Is oppoſed by the archbiſhop of Canterbury;

In this career of reſentment and cruelty, however, he found himſelf oppoſed by the archbiſhop of Canterbury, whom he had appointed to collect the taxes laid on for the ſupport of the French war. That prelate happening to be abſent at the time of the king's arrival, did not immediately feel the effects of his reſentment. Being informed, however, of the humour in which his ſovereign was, he iſſued a ſentence of excommunication againſt all who, on any pretence whatever, ſhould exerciſe violence againſt the perſons or eſtates of clergymen, or who infringed thoſe privileges ſecured by the great charter, or who accuſed a prelate of treaſon, or any other crime, in order to bring him under the king's diſpleaſure. A regular combination was formed againſt the king by the clergy, with the primate at their head; who, to execute the indignation of the people as much as poſſible, reported, that the king intended to recal the general pardon and the remiſſion to old debts which had been granted, and to impoſe new and arbitrary taxes without conſent of parliament. The archbiſhop alſo, in a letter to the king, informed him, that there were two powers by which the world was governed, *viz.* the holy pontifical apoſtolical dignity and the regal authority; of which the clerical power was evidently the ſupreme, as the prieſts were to anſwer even for the conduct of kings at the laſt judgment; and were beſides the ſpiritual fathers of all the faithful, kings and princes not excepted; having, beſides, a heavenly charter, intitling them to direct their wills and actions, and to cenſure their tranſgreſſions. On this the king reſolved to mortify him, by ſending no ſummons to him when the parliament was called: but the prelate, undaunted by this mark of reſentment, appeared before the gates of the parliament-houſe with his croſier in his hand, demanding admittance as the firſt peer of the realm. This application was rejected for two days, but at laſt complied with; and the parliament now ſeemed inclined to abridge the king's authority conſiderably.

176
And obliged at laſt to ſubmit.

They began with obſerving, that as the great charter had been violated in many points, particularly by the illegal impriſonment of many freemen and the ſeizure of their goods, it was neceſſary to confirm it anew, and to oblige all the chief officers of the law and others to ſwear to the obſervance of it. It was alſo required, that whenever any of the great offices became vacant, the king ſhould fill them up by the advice of his council and the conſent of ſuch barons as ſhould at the time be found to reſide in the neighbourhood of the court. They enacted alſo, that on the third day of every ſeſſion the king ſhould reſume all ſuch offices into his own hand, excepting thoſe of the juſtices of the two benches and the barons of exchequer; that the miniſters ſhould for the time be reduced to private perſons; that they ſhould in that condition anſwer before parliament to any accuſation preferred againſt them; and that, if they were found in any reſpect guilty, they ſhould be finally deprived of their offices, and others appointed in their ſtead. In return for ſuch ample conceſſions, the king was offered a grant of 20,000 ſacks of wool; and ſuch was his urgent neceſſity, that he was compelled to accept of it even upon theſe terms. Still, however, he determined to adhere to his engagements no longer than till this neceſſity was removed. Though the agreement therefore was ratified in full parliament, he ſecretly entered a proteſt, that, as ſoon as his convenience permitted, he would from his own authority revoke what had been extorted from him. This proteſt was afterwards confirmed by a public edict; in which he aſſerted, that that ſtatute had been made contrary to law; that it was prejudicial to the prerogatives of the crown, which he had only diſſembled when he ſeemed to ratify it; and that in his own breaſt he had never aſſented to it: and declared, that from thenceforth it had no force or authority.

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This exertion of arbitrary power, which it might have been imagined would have occaſioned a prodigious clamour, was not taken notice of by any of the ſubſequent parliaments; ſo that in the courſe of two years Edward had entirely regained his authority, and obtained a repeal of the obnoxious ſtatute juſt mentioned.

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Having thus ſettled matters to his ſatisfaction, the king reſumed his expedition againſt France, where he gained great advantages. In his abſence the Scots invaded England; but were entirely defeated at Durham, and their king himſelf taken priſoner. The Engliſh king in the mean time continued his victories on the continent; in which he was greatly aſſiſted by Edward ſurnamed the *Black Prince*, the greateſt hero recorded in the Engliſh annals. But for the wars of Edward III. and the exploits of this famous prince, ſee the articles SCOTLAND and FRANCE. The Black Prince died on the 8th of June 1376, and the king ſurvived only about a year.

179
Richar

He expired on the 21ſt of June 1377, and was ſucceeded by his ſecond ſon Richard.

As the new king was only eleven years old when he aſcended the throne, the government was veſted in the hands of his three uncles the dukes of Lancaſter, York, and Glooeſter. The different diſpoſitions of theſe noblemen, it was thought, would cauſe them check the deſigns of each other. Lancaſter was neither popular nor enterpriſing; York was indolent and weak; and Glooeſter turbulent, popular, and ambitious. Diſcontents firſt aroſe among the common people. They had now acquired a ſhare of liberty ſufficient to inſpire them with a deſire for more, and this deſire was greatly encreaſed by the diſcourſes of one John Ball a ſeditious preacher. He went about the country, and inculcated on his audience, that mankind were all derived from one common ſtock; and that all of them had equal right to liberty and the goods of nature, of which they had been deprived by the ambition of a few inſolent rulers.

Theſe doctrines were greedily ſwallowed by the populace, who were farther inflamed by a new impoſition of three groats a-head upon every perſon in the kingdom above 15 years of age. This had been granted as a ſupply by parliament, and was no doubt neceſſary on account of the many expenſive wars in which the kingdom was engaged; but its apparent injuſtice, in laying no more burden upon the rich than the poor, excited the utmoſt reſentment of the people. The manner, too, of collecting this tax, ſoon furniſhed them with an occaſion of revolt. It began in Eſſex, where a report was induſtriouſly ſpread that the peaſants were to be deſtroyed, their houſes burned, and their farms plundered. A blackſmith, well known by the name of of *Wat Tyler*, was the firſt that excited them to arms. The tax-gatherers coming to this man's houſe while he was at work, demanded payment for his daughter. This he refuſed, alleging that ſhe was under the age mentioned in the act. One of theſe fellows offered to produce a very indecent proof to the contrary, and at the ſame time laid hold of the maid. This the father reſenting, immediately knocked out the ruffian's brains with his hammer. The byſtanders applauded the action; and exclaimed that it was high time for the people to take vengeance on their tyrants, and to vindicate their native liberty. The whole country immediately took arms, and the inſurgents ſoon amounted to about 100,000 men. They advanced to Blackheath, where they ſent a meſſage to the king, who had taken ſhelter in the tower, deſiring a conference with him. The king was deſirous of complying with their demands, but was intimidated by their fierce behaviour In the mean time they entered the city, burning and plundering the houſes of ſuch as were obnoxious for their power or riches. Their animoſity was particularly levelled againſt the lawyers, to whom they ſhowed no mercy. The king at laſt, knowing that the tower was not able to reſiſt their aſſaults, went out among them, and deſired to know their demands. To this they made a very humble remonſtrance; requiring a general pardon, the abolition of ſlavery, freedom of commerce in the market-towns, and a fixed rent inſtead of thoſe ſervices required by the tenure of villenage. The king granted all theſe requeſts; and charters were made out by which the grant was ratified. In the mean time, however, another body of theſe inſurgents had broke into the tower, and murdered the chancellor, the primate, and the treaſurer, with ſome other officers of diſtinction. They then divided themſelves into bodies, and took up their quarters in different parts of the city. At the head of one of theſe was Wat Tyler, who led his men into Smithfield, where he was met by the king, who invited him to a conference under pretence of hearing and redreſſing his grievances. Tyler ordered his companions to retire till he ſhould give them a ſignal, and boldly ventured to begin a conference with the king in the midſt of his retinue. His demands were, That all ſlaves ſhould be ſet free; that all commonages ſhould be open to the poor as well as to the rich; and that a general pardon ſhould be paſſed for the late outrages. Whilſt he made theſe demands, he now and then lifted up his ſword in a menacing manner: which inſolence ſo raiſed the indignation of William Walworth lord mayor of London, that, without conſidering the danger to which he expoſed his majeſty, he ſtunned Tyler with a blow of his mace; while one of the king's knights riding up, diſpatched him with his ſword. The mutineers, ſeeing their leader fall, prepared themſelves to take revenge. Their bows were already bent for execution; when Richard, though not yet 16 years of age, rode up to the rebels, and with admirable preſence of mind cried out: "What, my people, will you kill your king? Be not concerned for the loſs of your leader. I myſelf will now be your general. Follow me into the field, and you ſhall have whatever you deſire." The multitude immediately deſiſted, and followed the king into the fields, where he granted them the ſame charters that he had before granted to their companions. Theſe charters, however, were ſoon after revoked, and the common people reduced to the ſame ſituation in which they had formerly been.

The courage, addreſs, and preſence of mind, which the king had diſcovered in quelling ſuch a dangerous tumult, gave great hopes to the nation: but, in proportion as Richard advanced in years, theſe hopes were blaſted; and his want of capacity, or at leaſt of ſolid judgment, appeared in every enterpriſe he attempted. The king had unluckily loſt the favour of the common people after the inſurrection juſt mentioned. He allowed the parliament to revoke the charters of enfranchiſement and pardon which had been granted; ſome of the ringleaders in the late diſorders had been ſeverely puniſhed, and ſome even put to death without any form of proceſs or trial. Thus the popular leaders were greatly exaſperated by this cruelty, though probably the king did not follow the dictates of his own mind ſo much in it as the advice of his counſellors. But having thus loſt the favour of one party, he quickly after fell under the diſpleaſure of the other alſo. Suppoſing himſelf to be in too great ſubjection to his uncles, particularly the Duke of Glouceſter, he attempted to ſhake off the yoke, by raiſing others to ſuch a degree of power as might enable them to rival them. His firſt favourite was Robert de Vere Earl of Oxford, a young man of an agreeable perſon, but diſſolute in his behaviour, who ſoon acquired an abſolute aſcendant over him. So much was he determined to ſhow his attachment to this nobleman, that he firſt created him Marquis of Dublin, a title never known in England before; then Duke of Ireland; transferring to him the entire ſovereignty of that iſland by patent for life. He gave him in marriage his couſin-german, the daughter of the Earl of Bedford; but ſoon after permitted him to divorce her for another lady with whom he had fallen in love. This nobleman ſoon became the diſpenſer of all the king's favours to ſuch a degree, that a conſpiracy was formed againſt him. At the head of which were, Mowbray Earl of Nottingham, Fitz Alan Earl of Arundel, Percy Earl of Northumberland, Montacute Earl of Saliſbury, and Beauchamp Earl of Warwick. Vere was impeached in parliament; and tho' nothing of moment was even alleged againſt him, he was condemned and deprived of his office. They next proceeded to attack the royal authority itſelf. Under pretence that the king was yet unable to govern the kingdom, though at that time 21 years of age, they appointed a commiſſion of 14 perſons to whom the ſovereignty was to be transferred for a year. This meaſure was driven forward by the duke of Glouceſter, and none but his own faction were admitted as members of the committee. The king could not without regret perceive himſelf thus totally deprived of authority. He firſt endeavoured to gain over the parliament to his intereſts, by influencing the ſheriffs of each county, who were then the only returning officers. This meaſure failing, he next applied to the judges. They declared, that the commiſſion which had deprived the king of his authority was unlawful, and that thoſe who procured or adviſed it were puniſhable with death. Their ſentence was quickly oppoſed by declarations from the lords. The Duke of Glouceſter armed his partiſans; and appeared at Haringay park near Highgate,

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The king loſes the favour of the people.

183
His exceſſive favour for the Earl of Oxford.

184
A conſpiracy againſt the king.

England.

Highgate, at the head of a body of men ſufficient to intimidate the king and all his adherents. Theſe inſurgents, ſenſible of their own power, began by demanding of the king the names of thoſe who had adviſed him to his late raſh meaſures. A few days afterwards they appeared armed in his preſence, and accuſed by name the Archbiſhop of York, the Duke of Ireland, the Earl of Suffolk, and Sir Robert Treſilian, one of the judges who had declared in his favour, together with Sir Nicholas Bember, as public and dangerous enemies to the ſtate. The duke of Ireland fled into Cheſhire, where he attempted to raiſe a body of forces; but waa quickly obliged to fly into Flanders, on the arrival of the Duke of Gloceſter with a ſuperior army. Soon after, the king was obliged to ſummon a parliament, where an accuſation was drawn up againſt five of his counſellors. Of theſe only Sir Nicholas Bember was preſent; and he was quickly found guilty, condemned, and executed, together with Sir Robert Treſilian, who had been diſcovered and taken during the interval. Lord Beauchamp of Holt was ſoon after condemned and executed; and Sir Simon Burley, who had been appointed the king's governor, ſhared the ſame fate, though the queen continued for three hours on her knees before the Duke of Gloceſter, imploring his pardon.

285
The king takes the power into his own hands.

Such unparalleled inſolence and barbarity in a ſubject could not go unpuniſhed. In 1389, the king, at an extraordinary council of the nobility aſſembled after Eaſter, to the aſtoniſhment of all preſent, deſired to know his age. Being told that he was turned of two and twenty, he alleged that it was then time for him to govern without help; and that there was no reaſon why he ſhould be deprived of thoſe rights which the meaneſt of his ſubjects enjoyed. The lords anſwered in ſome confuſion, that he had certainly an undiſputed right to take upon himſelf the government of the kingdom. "Yes (replied the king), I have long been under the government of tutors; and I will now firſt ſhow my right to power by their removal." He then ordered Thomas Arundel, whom the commiſſioners had lately appointed chancellor, to give up the ſeals; which he next day delivered to William Wickham biſhop of Wincheſter. He next removed the Duke of Gloceſter, the Earl of Warwick, and other lords of the oppoſition, from the council; and all the great officers of the houſehold, as well as the judges, were changed.

The king being thus left at liberty to govern as he thought proper, for ſome time behaved in ſuch a manner as to gain the affections of the people. It does not appear indeed that he ever gave much cauſe of complaint; but it was impoſſible for any prince in thoſe days to keep himſelf ſecure on the throne but by a very ſevere and vigorous adminiſtration. The Duke of Gloceſter, perceiving that Richard was not of a warlike diſpoſition, frequently ſpoke with contempt of his perſon and government, and deliberated concerning the lawfulneſs of throwing off all allegiance to him. The king being informed of his conduct by ſpies appointed for that purpoſe, at laſt formed a reſolution of ridding himſelf of Gloceſter and his faction at once. He therefore ordered that nobleman to be immediately arreſted and ſent over to Calais, where there was no danger of his being reſcued by his numerous adherents. The earls of Arundel and Warwick were ſeized at the ſame time; and a new parliament, which the king knew would be perfectly obedient to his will, was ſummoned to Weſtminſter. Here the commiſſion of 14, who had uſurped on the royal authority, was annulled for ever; all thoſe acts which had condemned his former miniſters were repealed; and the general pardon which the king had formerly given when he aſſumed the government into his own hands, was revoked. Several of Gloceſter's party were condemned and executed, and at laſt that nobleman himſelf was called for to take his trial as well as the reſt; but he had before been privately diſpatched in priſon.

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After the deſtruction of the Duke of Gloceſter and the heads of his party, a miſunderſtanding aroſe among the noblemen who had joined in the proſecution. The Duke of Hereford appeared in parliament, and accuſed the Duke of Norfolk of having ſpoken ſeditious words againſt his majeſty in a private converſation. Norfolk denied the charge, gave Hereford the lie, and offered to prove his innocence by ſingle combat. The challenge was accepted; but on the day appointed for the duel, the king would not ſuffer the combatants to engage, but commanded both of them to leave the kingdom. The Duke of Norfolk he baniſhed for life, but the Duke of Hereford only for ten years. The former retired to Venice, where in a ſhort time he died of a broken heart. Hereford behaved in a reſigned and ſubmiſſive manner; which ſo pleaſed the king, that he conſented to ſhorten the time of his baniſhment four years: he alſo granted him letters patent, enſuring him of the enjoyment of any inheritance which ſhould fall to him during his abſence; but upon the death of his father the Duke of Lancaſter, which happened ſhortly after, Richard revoked thoſe letters, and kept the eſtate to himſelf.

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This laſt injury inflamed the reſentment of Hereford to ſuch a degree, that he formed a deſign of dethroning the king. He was a great favourite both with the army and people; he was immenſely rich, and connected by blood or alliance with all the great families of the nation. The king at the ſame time, it is ſaid, gave himſelf up to an idle, effeminate life; and his miniſters following his example, the national honour was loſt. The number of malecontents daily increaſed, and only waited for the abſence of the king, in order to put their ſchemes in execution; and this opportunity ſoon offered.

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The Earl of March, preſumptive heir to the crown, having been appointed the king's lieutenant in Ireland, was ſlain in a ſkirmiſh with the natives of that country; which ſo incenſed Richard, that, unmindful of his precarious ſituation at home, he went over to Ireland with a conſiderable army, in order to revenge his death in perſon. The Duke of Lancaſter (for that was the title which Hereford aſſumed on the death of his father) hearing of the king's abſence, inſtantly embarked at Nantz; and with a retinue only of 60 perſons in three ſmall veſſels, landed at Ravenſpur in Yorkſhire. The Earl of Northumberland, who had long been a malecontent, together with Henry Percy his ſon, who from his ardent valour was ſurnamed *Hotſpur*, immediately joined him with their forces; and the people flocked to him in ſuch numbers, that in a few days his army amounted to 60,000 men.

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Richard, in the mean time, continued in perfect ſecurity in Ireland for ſome time. Contrary winds for three weeks together prevented his receiving any news of the rebellion which was begun in his native dominions. He landed therefore at Milford Haven without ſuſpicion, attended by a body of 20,000 men; but immediately found himſelf oppoſed by a power which he could by no means reſiſt. His army gradually deſerted him, till at laſt he was obliged to acquaint the duke, that he would ſubmit to whatever terms he pleaſed to preſcribe. The duke did not think proper to enter into any treaty with the king; but carried him to London, where he was confined cloſe priſoner in the Tower, formally depoſed by parliament, or rather by the Duke of Lancaſter, and at laſt put to death. The manner of his death is variouſly related. According to ſome, eight or nine ruffians were ſent to the caſtle of Pomfret, whither the unhappy prince had been removed, in order to diſpatch him. They ruſhed unexpectedly into his apartment; but Richard, knowing their deſign, reſolved to ſell his life as dear as poſſible. He wreſted a pole-ax from one of the murderers, with which he killed four of them; but was at length overpowered and killed. Others relate that he was ſtarved in priſon; and that, after he was denied all nouriſhment, he prolonged his life 14 days, by feeding on the flocks of his bed. He died in the year 1399, in the 34th year of his age, and 23d of his reign.—It was during the reign of Richard II. that Wickliff, the noted reformer, publiſhed his doctrines in England. See WICKLIFF.

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After ſentence of depoſition had been pronounced on Richard by both houſes of parliament, the throne being then vacant, the Duke of Lancaſter ſtepped forth; and having croſſed himſelf on the forehead and on the breaſt, and called on the name of Chriſt, gave in his claim to the throne in the following words, which we ſhall give in the original language. "In the name of Fadher, Son, and Holy Ghoſt, I Henry of Lancaſter, challenge this rewme of Ynglonde, and the croun, with all the membres and the appurtenances; als I that am deſcendit by right line of the blode, coming fro the gude King Henry therde, and throge that right that God of his grace hath ſent me, with help of kyn, and of my frendes to recover it; the which rewme was in poynt to be ondone by defaut of governance, and ondoying of the gude laws."

The right which the duke here claimed by deſcent from Henry III. proceeded on a falſe ſtory that Edmond Earl of Lancaſter, ſon of Henry III. was really the elder brother of Edward I.; but that, by reaſon of ſome deformity in his perſon, he had been poſtponed in the ſucceſſion, and Edward the younger brother impoſed on the nation in his ſtead. The preſent Duke of Lancaſter inherited from Edmund, by his mother, the right which he now pretended to the crown; though the falſehood of the ſtory was ſo generally known, that he thought proper to mention it only in general terms.—No oppoſition, however, was made to the validity of this title in parliament; and thus commenced the differences between the houſes of York and Lancaſter, which were not terminated but by many bloody and ruinous wars.

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The reign of Henry IV. was little elſe than a continued ſeries of inſurrections. In the very firſt parliament he called, no fewer than 40 challenges were given and accepted by different barons; and though Henry had ability and addreſs enough to prevent theſe duels from being fought, it was not in his power to prevent continual inſurrections and combinations againſt himſelf. The moſt formidable one was conducted by the Earl of Northumberland, and commenced A. D. 1402. The occaſion of it was, that Henry denied the Earl liberty to ranſom ſome Scots priſoners which had been taken in a ſkirmiſh with that nation. The king was deſirous of detaining them in order to increaſe his demands upon Scotland in making peace; but as the ranſom of priſoners was in that age looked upon as a right belonging to thoſe who had taken them, the earl thought himſelf grievouſly injured. The injury appeared ſtill the greater, becauſe Northumberland conſidered the king as indebted to him both for his life and crown. He reſolved therefore to dethrone Henry; and to raiſe to the throne young Mortimer, who was the true heir to the crown, as being the ſon of Roger Mortimer Earl of March, whom Richard II. had declared his ſucceſſor. For this purpoſe he entered into an alliance with the Scots and Welſh, who were to make an irruption into England at the ſame time that he himſelf was to raiſe what forces he could in order to join them. But when all things were prepared for this inſurrection, the Earl found himſelf unable to lead on the troops, by a ſudden fit of illneſs with which he was ſeized at Berwick. On this, young Piercy (ſurnamed *Hotſpur*) took the command; and marched towards Shrewſbury, in order to join the Welſh. But the king had happily a ſmall army with which he intended to have acted againſt the Scots; and knowing the importance of celerity in civil wars, inſtantly hurried down, that he might give battle to the rebels. He approached Shrewſbury before a junction with the Welſh could be effected; and the impatience of Piercy urged him to an engagement, which at that time he ought to have declined. The evening before the battle, he ſent a manifeſto to Henry; in which he renounced his allegiance, ſet the king at defiance, and enumerated all the grievances of which he imagined the nation might juſtly complain. He reproached him (and very juſtly) with his perjury; for Henry, on his firſt landing in England, had ſworn upon the goſpels, before the Earl of Northumberland, that he had no other intention but to recover poſſeſſion of the duchy of Lancaſter, and that he would ever remain a faithful ſubject to King Richard. He aggravated his guilt, in firſt dethroning and then murdering that prince; and in uſurping on the title of the houſe of Mortimer; to whom, both by lineal ſucceſſion and by declarations of parliament, the throne, then vacant by Richard's death, did of right belong. Several other heavy charges were brought againſt him; which, at that time, could be productive of no other effect than to irritate the king and his adherents to the utmoſt.

England.

192
Inſurrection of the Earl of Northumberland.

193
His ſon defeated and killed at Shrewſbury.

The armies on each ſide were in number about 12,000; ſo that they were not unmanageable by their commanders; and as both leaders were men of known bravery, an obſtinate engagement was expected. The battle was fought on the 20th of July 1403; and we can ſcarce find in thoſe ages any other in which the ſhock was ſo terrible and conſtant. At laſt Piercy being killed by an unknown hand, the victory was decided

cided in favour of the royaliſts. There are ſaid to have fallen on that day near 2300 gentlemen, and 6000 private men, of whom near two thirds were of Piercy's army.

The Earl of Northumberland having recovered from his ſickneſs, and levied an army, was on his march to join his ſon; but being oppoſed by the Earl of Weſtmoreland, and hearing of the defeat at Shrewſbury, he diſmiſſed his forces, and came with a ſmall retinue to the king at York. He pretended that his ſole intention was to mediate between the contending parties; and the king thought proper to accept of his apology, and grant him a pardon for his offence. The other rebels were treated with equal lenity; and none of them, except the Earl of Worceſter and Sir Richard Vernon, who were regarded as the chief authors of the inſurrection, periſhed by the hands of the executioner. This lenity, however, was not ſufficient to keep the kingdom quiet; one inſurrection followed another almoſt during the whole of this reign; but either through Henry's vigilance, or the bad management of the conſpirators, they never could unite their forces in ſuch a manner as was neceſſary for bringing their projects to bear.

194 Archbiſhop of York executed.

This reign is remarkable for the firſt capital puniſhment inflicted on a clergyman of high rank. The Archbiſhop of York having been concerned in an inſurrection againſt the king, and happening to be taken priſoner, was beheaded without either indictment, trial, or defence; nor was any diſturbance occaſioned by this ſummary execution. But the moſt remarkable tranſaction of this reign was, the introduction of that abſurd and cruel practice of burning people on account of their religion. Henry, while a ſubject, was thought to have been very favourable to the doctrines of Wickliffe; but when he came to the throne, finding his poſſeſſion of it very inſecure, he thought ſuperſtition a neceſſary implement of his authority, and therefore determined by all means to pay court to the clergy. There were hitherto no penal laws againſt hereſy; not indeed through the toleration of the court of Rome, but through the ſtupidity of the people, who could not perceive the abſurdities of the eſtabliſhed religion. But when the learning and genius of Wickliffe had once broken the fetters of prejudice, the eccleſiaſtics called aloud for the puniſhment of his diſciples; and Henry, who was very little ſcrupulous in his conduct, reſolved to gratify them. He engaged parliament to paſs a law for this purpoſe: it was enacted, that when any heretic, who relapſed, or refuſed to abjure his opinions, was delivered over to the ſecular arm by the biſhop or his commiſſaries, he ſhould be committed to the flames before the whole people. This weapon did not remain long unemployed in the hands of the clergy. William Sautré, rector of St Oſithes in London, had been condemned by the convocation of Canterbury; his ſentence was ratified by the houſe of Peers; the king iſſued his writ for the execution; and the unhappy man was burnt alive in the year 1401. The doctrines of Wickliffe, however, ſeem to have already gained ground very conſiderably in England. In 1405, the commons, who had been required to grant ſupplies, propoſed in plain terms to the king to ſeize all the temporalities of the church, and employ them as a perpetual fund to ſerve the exigencies of the ſtate. They inſiſted that the clergy poſſeſſed a third of the lands of the kingdom; and they contributed nothing to the public burdens; and that their exorbitant riches tended only to diſqualify them from performing their miniſterial functions with proper zeal and attention. When this addreſs was preſented, the Archbiſhop of Canterbury, who then attended the king, objected that the clergy, though they went not in perſon to the wars, ſent their vaſſals and tenants in all caſes of neceſſity; while at the ſame time, they themſelves who ſtaid at home were employed night and day in offering up their prayers for the happineſs and proſperity of the ſtate. The ſpeaker anſwered with a ſmile, that he thought the prayers of the church but a very ſlender ſupply. The archbiſhop, however, prevailed in the diſpute; the king diſcouraged the application of the commons; and the lords rejected the bill which the lower houſe had framed for deſpoiling the church of her revenues. The commons were not diſcouraged by this repulſe. In 1410, they returned to the charge with more zeal than before. They made a calculation of all the eccleſiaſtical revenues, which, by their account, amounted to 485,000 marks a-year, and included 18,400 ploughs of land. They propoſed to divide this property among 15 new earls, 1500 knights, 6000 eſquires, and 100 hoſpitals; beſides 20,000 pounds a-year, which the king might keep for his own uſe: and they inſiſted that the clerical functions would be better performed than at preſent, by 15,000 pariſh-prieſts, at the rate of 7 marks a-piece of yearly ſtipend. This application was accompanied with an addreſs for mitigating the ſtatutes enacted againſt the Wickliffites or Lollards, ſo that the king knew very well from what ſource it came. He gave the commons, however, a ſevere reply; and further to ſatisfy the church that he was in earneſt, ordered a Lollard to be burnt before the diſſolution of parliament.

195 Burning of heretics introduced.

The king had been for ſome time ſubject to fits, which continued to increaſe, and gradually brought him to his end. He expired at Weſtminſter in 1413, in the 46th year of his age, and the 13th of his reign. He was ſucceeded by his ſon Henry V. whoſe martial talents and character had at firſt occaſioned unreaſonable jealouſies in the mind of his father, ſo that he thought proper to exclude him from all ſhare of public buſineſs. The active ſpirit of Henry being thus reſtrained from its proper exerciſe, broke out in every kind of extravagance and diſſipation. It is even reported, that, when heated with liquor, he ſcrupled not to accompany his riotous aſſociates in attacking the paſſengers on the ſtreets and highways, and robbing them of their goods. No ſooner, however, did he aſcend the throne, than he called together his former companions, acquainted them with his intended reformation, exhorted them to imitate his example; but ſtrictly prohibited them, till they had given proofs of their ſincerity in this particular, to appear any more in his preſence: after which, he diſmiſſed them with liberal preſents. His father's wiſe miniſters, who had checked his riots, found that they had, unknown to themſelves, been paying the higheſt court to their ſovereign; and were received with all the marks of favour and confidence. The chief juſtice, who had formerly impriſoned the prince himſelf, and therefore trembled to approach the royal preſence, met with praiſes

196 Henry

5 praiſes

praiſes inſtead of reproaches for his paſt conduct, and was exhorted to perſevere in the ſame rigorous and impartial execution of the laws. The king was not only anxious to repair his own miſconduct, but alſo to make amends for thoſe iniquities into which policy or neceſſity of affairs had betrayed his father. He expreſſed the deepeſt ſorrow for the fate of the unhappy King Richard, and even performed his funeral obſequies with pomp and ſolemnity, and heaped favours upon all thoſe who had ſhown themſelves attached to him. He took into favour the young Earl of March, though his competitor for the throne; and gained ſo far on his gentle and unambitious nature, that he remained ever after ſincerely attached to him. The family of Piercy was reſtored to its fortune and honours; and the king ſeemed deſirous to bury all diſtinctions in oblivion. Men of merit were preferred, whatever party they had been of; all men were unanimous in their attachment to Henry; and the defects of his title were forgot amidſt the perſonal regard which was univerſally paid him.

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The only party which Henry was not able to overcome was the new ſect of Lollards, or reformers of religion. Theſe were now gaining ſuch ground in England, that the Romiſh clergy were greatly alarmed, and Henry was determined to execute the laws upon them. The head of that party at preſent was Sir John Oldcaſtle, Lord Cobham; a nobleman who had diſtinguiſhed himſelf by his valour and military talents on many occaſions, and acquired the eſteem both of the late and preſent king. His high character and zeal for the new ſect pointed him out to Arundel Archbiſhop of Canterbury as a proper object of eccleſiaſtical fury, and therefore he applied to Henry for permiſſion to indict him. The king deſired him firſt to try gentle methods, and undertook to converſe with Lord Cobham himſelf upon religious ſubjects. He did ſo, but could not prevail, and therefore abandoned Cobham to his enemies. He was immediately condemned to the flames: but having found means to make his eſcape, he raiſed an inſurrection; which was ſoon ſuppreſſed, without any other conſequence than that of bringing a ſtain on the ſect to which he belonged. Cobham himſelf made his eſcape, but four years afterwards was taken and executed as a traitor. Immediately after, the moſt ſevere laws were enacted againſt the Lollards. It was enacted, that whoever was convicted of Lollardy, beſides ſuffering capital puniſhment according to the laws formerly eſtabliſhed, ſhould alſo forfeit his lands and goods to the king; and that the chancellor, treaſurer, juſtices of the two benches, ſheriffs, juſtices of the peace, and all the chief magiſtrates in every city and borough, ſhould take an oath to uſe their utmoſt endeavours for the extirpation of hereſy.

Notwithſtanding theſe terrible laws, the very parliament which enacted them, namely that of 1414, when the king demanded a ſupply, renewed the offer formerly preſſed upon Henry IV. and intreated the king to ſeize all the eccleſiaſtical revenues, and convert them to the uſe of the crown. The clergy were greatly alarmed. They could offer the king nothing of equal value. They agreed, however, to confer on him all the priories alien, which depended on capital abbeys in Normandy, and which had been bequeathed to them when that province was united to England. The moſt effectual method, however, of warding off the blow at preſent was by perſuading the King to undertake a war with France, in order to recover the provinces in that kingdom which had formerly belonged to England. This was agreeable to the dying injunction of Henry IV. He adviſed his ſon never to let the Engliſh remain long in peace, which was apt to breed inteſtine commotions; but to employ them in foreign expeditions, by which the prince might acquire honour, the nobility in ſharing his dangers might attach themſelves to his perſon, and all the reſtleſs ſpirits find occupation for their inquietude. The natural diſpoſition of Henry ſufficiently inclined him to follow this advice, and the civil diſorders of France gave him the faireſt proſpect of ſucceſs. 198 France invaded. Accordingly, in 1415, the king invaded France at the head of 30,000 men. The great progreſs he made there is related at length under the article FRANCE. He had eſpouſed the king's daughter, and conquered the greateſt part of the kingdom. His queen was delivered of a ſon named *Henry*, whoſe birth was celebrated by the greateſt rejoicings both at London and Paris; and the infant prince ſeemed to be univerſally regarded as heir to both monarchies. But Henry's glory, when it ſeemed to be approaching the ſummit, was blaſted at once by death, and all his mighty projects vaniſhed. He was ſeized with a fiſtula, a diſtemper which at that time the phyſicians had not ſkill enough to cure; and he expired on the 31ſt of Auguſt 1422, in the 34th year of his age, and the 10th of his reign. 199 Death of Henry V.

200 Henry VI. Henry VI. ſucceeded to the throne before he was quite a year old, and his reign affords only the moſt diſmal accounts of misfortunes and civil wars. His relations very ſoon began to diſpute about the adminiſtration during the minority. The Duke of Bedford, one of the moſt accompliſhed princes of the age, was appointed by parliament protector of England, defender of the church, and firſt counſellor to the king. His brother, the Duke of Gloceſter, was fixed upon to govern in his abſence, while he conducted the war in France; and in order to limit the power of both brothers, a council was named, without whoſe advice and approbation no meaſure could be carried into execution.

The kingdom of France was now in the moſt deſperate ſituation. The Engliſh were maſters of almoſt the whole of it. Henry VI. though but an infant, was ſolemnly inveſted with regal power by legates from Paris; ſo that Charles VII. of France ſucceeded only to a nominal kingdom. With all theſe great advantages, however, the Engliſh daily loſt ground; and in the year 1450 were totally expelled from France †. It may eaſily be imagined, that ſuch a train of bad ſucceſs would produce diſcontents among the rulers at home. The Duke of Gloceſter was envied by many on account of his high ſtation. Among theſe was Henry Beaufort, Biſhop of Wincheſter, great uncle to the king, and the legitimate ſon of John of Gaunt brother to Richard II. The prelate, to whom the care of the king's education had been committed, was a man of great capacity and experience, but of an intriguing and dangerous diſpoſition. He had frequent diſputes with the Duke of Gloceſter, over whom he gained ſeveral advantages on account of his open temper. The Duke of Bedford

† See *France*.

ford employed both his own authority and that of parliament to reconcile them, but in vain; their mutual animoſities ſerved for ſeveral years to embarraſs government, and to give its enemies every advantage. The ſentiments of the two leaders were particularly divided with regard to France. The biſhop laid hold of every proſpect of accommodation with that country; and the Duke of Gloceſter was for maintaining the honour of the Engliſh arms, and regaining whatever had been loſt by defeats or delay. Both parties called in all the auxiliaries they could. The biſhop reſolved to ſtrengthen himſelf by procuring a proper match for Henry, at that time 23 years old; and then bringing over the queen to his intereſts. Accordingly, the Earl of Suffolk, a nobleman whom he knew to be ſtedfaſt in his attachments, was ſent over to France, apparently to ſettle the terms of a truce which had then been begun, but in reality to procure a ſuitable match for the king. 201

Married to Margaret of Anjou.

The biſhop and his friends had caſt their eye on Margaret of Anjou, daughter of Regnier, titular king of Sicily, Naples, and Jeruſalem; but without either real power or poſſeſſions. She was conſidered as the moſt accompliſhed princeſs of the age, both in mind and perſon; and it was thought would, by her own abilities, be able to ſupply the defects of her huſband, who appeared weak, timid, and ſuperſtitious. The treaty was therefore haſtened on by Suffolk, and ſoon after ratified in England. The queen came immediately into the biſhop's meaſures: Gloceſter was deprived of all real power, and every method taken to render him odious to the public. One ſtep taken for this purpoſe was to accuſe his ducheſs of witchcraft. She was charged with converſing with one Roger Bolingbroke, a prieſt and reputed necromancer; and alſo with one Mary Gourdemain, who was ſaid to be a witch. It was aſſerted that theſe three in conjunction had made an image of the king in wax, which was placed before a gentle fire; and as the wax diſſolved, the King's ſtrength was expected to waſte; and upon its total diſſolution, his life was to be at an end. This accuſation was readily believed in that ſuperſtitious age. The priſoners were pronounced guilty; the ducheſs was condemned to do penance and ſuffer perpetual impriſonment; Bolingbroke the prieſt was hanged, and the woman burnt in Smithfield.

The biſhop, called alſo the *Cardinal*, of Wincheſter, was reſolved to carry his reſentment againſt Gloceſter to the utmoſt. He procured a parliament to be ſummoned, not at London, which was too well affected to the duke, but at St Edmundſbury, where his adherents were ſufficiently numerous to overawe every opponent. 202 As ſoon as Gloceſter appeared, he was accuſed of treaſon and thrown into priſon; and on the day on which he was to make his defence, he was found dead in his bed, though without any ſigns of violence upon his body.

Duke of Gloceſter murdered.

The death of the Duke of Gloceſter was univerſally aſcribed to the Cardinal of Wincheſter, who himſelf died ſix weeks after, teſtifying the utmoſt remorſe for the bloody ſcene he had acted. What ſhare the queen had in this tranſaction, is uncertain; but moſt people believed that without her knowledge the duke's enemies durſt not have ventured to take away his life. The king himſelf ſhared in the general ill-will, and he never had the art to remove the ſuſpicion. His incapacity alſo began every day to appear more clearly, and a pretender to the throne ſoon made his appearance.

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In the year 1450, Richard Duke of York began to think of preferring his claims to the crown. All the males of the houſe of Mortimer were extinct; but Anne, the ſiſter of the laſt Earl of March, having eſpouſed the Earl of Cambridge, who had been beheaded for treaſon in the reign of Henry V. had tranſmitted her latent, but not yet forgotten claim, to her ſon Richard. This prince, deſcended by his mother from Philippa only daughter of the Duke of Clarence, ſecond ſon of Edward III. ſtood plainly in order of ſucceſſion before the King; who derived his deſcent from the duke of Lancaſter, third ſon of that monarch. The duke was a man of valour and abilities, as well as of ſome ambition; and he thought the weakneſs and unpopularity of the preſent reign afforded a favourable opportunity to aſſert his title. The enſign of Richard was a white roſe, that of Henry a red one; and this gave names to the two factions, who were now about to drench the kingdom in blood.

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After the Cardinal of Wincheſter's death, the Duke of Suffolk, who alſo had been concerned in the aſſaſſination of Gloceſter, governed every thing with uncontrollable ſway. His conduct ſoon excited the jealouſy of the other nobility, and every odious or unſucceſsful meaſure was attributed to him. The duke, however, imagining that his crimes were of ſuch a nature as could not be proved, boldly called upon his enemies to ſhow an inſtance of his guilt. The houſe of commons immediately opened againſt him a charge of corruption, tyranny, and treaſon. He was accuſed of being the cauſe of the loſs of France; of perſuading the French king, with an armed force, to invade England; and of betraying the ſecrets of ſtate. The popular reſentment againſt him was ſo ſtrong, that Henry, in order to ſecure him as much as poſſible, ſentenced him to five years baniſhment. This was conſidered by his enemies as an eſcape from juſtice. The captain of a ſhip was therefore employed to intercept him in his paſſage to France. He was ſeized near Dover, his head ſtruck off on the ſide of a long-boat, and his body thrown into the ſea.

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The complaints againſt Henry's government were heightened by an inſurrection headed by one John Cade, a native of Ireland. He had been obliged to fly over into France for his crimes: but, on his return, ſeeing the people prepared for violent meaſures, he aſſumed the name of *Mortimer*; and, at the head of 20,000 Kentiſh men, advanced towards Blackheath. The king ſent a meſſage to demand the cauſe of their riſing in arms. Cade in the name of the community anſwered, That their only aim was to puniſh evil miniſters, and procure a redreſs of grievances for the people. On this a body of 15,000 troops were levied, and Henry marched with them in perſon againſt Cade, who retired on his approach, as if he had been afraid of coming to an engagement. He lay in ambuſh, however, in a wood; not doubting but he ſhould be purſued by the king's whole army: but Henry was content with ſending a detachment after the fugitives, and returning to London himſelf; upon which Cade iſſued from his ambuſcade, and cut the detachment in pieces.

Soon after, the citizens of London opened their gates to the victor; and Cade, for ſome time, maintained great order and regularity among his followers. He always led them out into the fields in the night-time, and publiſhed ſeveral edicts againſt plunder and violence of any kind. He was not, however, long able to keep his people in ſubjection. He beheaded the treaſurer Lord Say, without any trial; and ſoon after, his troops committing ſome irregularities, the citizens reſolved to ſhut their gates againſt him. Cade endeavouring to force his way, a battle enſued, which laſted all day, and was ended only by the approach of night. The Archbiſhop of Canterbury, and the chancellor, who had taken refuge in the Tower, being informed of the ſituation of affairs, drew up, during the night, an act of amneſty, which was privately diſperſed among the rebels. This had ſuch an effect, that in the morning Cade found himſelf abandoned by his followers; and retreating to Rocheſter, was obliged to fly alone into the woods. A price being ſet on his head by proclamation, he was diſcovered and ſlain by one Alexander Eden; who, in recompence for this ſervice, was made governor of Dover caſtle.

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The court now began to entertain ſuſpicions that the inſurrection of John Cade had not happened merely in conſequence of his own machinations and ambition, but that he had been inſtigated thereto by the Duke of York, who, as we have already ſeen, pretended a right to the crown. As he was about this time expected to return from Ireland, and a report took place that he was now to aſſert his ſuppoſed right by force of arms, orders were iſſued in the king's name to deny him entrance into England. This was prevented by his appearing with no more than his ordinary attendants; but though he thus eſcaped the danger for the preſent, he inſtantly ſaw the neceſſity of proceeding in ſupport of his claim. His partizans were inſtructed to diſtinguiſh between his right by ſucceſſion and by the laws of the kingdom. The adherents of Lancaſter maintained, that though the advancement of Henry IV. might be looked upon as irregular, yet it was founded upon general conſent; or even allowing it to have been at firſt invalid, it had now been for a long time eſtabliſhed, and acquired ſolidity of conſequence; nor could the right of ſucceſſion at any rate be pleaded for the purpoſe of overthrowing the general peace and tranquillity of the kingdom. The principles of liberty as well as the maxims of true policy had been injured by the houſe of York; while the public were bound to thoſe of Lancaſter, no leſs by political than moral duty, in conſequence of the oaths of fealty that had been ſo often ſworn to them; the Duke of York himſelf having repeatedly ſworn allegiance to them, and thus indirectly renounced thoſe claims which he now brought forward to diſturb the public tranquillity. On the part of the Duke of York, it was replied, that the good of the people required the maintenance of order in the ſucceſſion of princes; that, by adhering conſtantly to this rule, a number of inconveniences would be prevented which muſt otherwiſe enſue; and though that order had been broken through in the caſe of Henry IV. it was never too late to remedy any pernicious precedent. It would indeed be a great encouragement to uſurpers, if the immediate poſſeſſion of power, or their continuance in it for a few years, could convert them into legal princes; and the people muſt be in a very miſerable ſituation, if all reſtraints on violence and ambition were taken off, and full liberty given to every innovator to make what attempts he pleaſed. They did not indeed deny that time might confer ſolidity on a government originally founded in uſurpation; but a very long courſe of years was not only required for this purpoſe, but a total extinction of thoſe who had any juſt title. The depoſition of Richard II. and advancement of Henry IV. were not legal acts, but the effects of mere levity in the people; in which the houſe of York had acquieſced from neceſſity, and not from any belief of the juſtice of their cauſe; nor could this be ever interpreted into any renunciation of their pretenſions; neither could the reſtoration of the true order of ſucceſſion be conſidered as an encouragement to rebellion and turbulence, but the correction of a former abuſe by which rebellion had been encouraged. Beſides, the original title of Henry IV. was founded entirely on preſent convenience; and even this was now entirely ſhifted to the houſe of York. The preſent prince was evidently incapable of governing the kingdom by reaſon of his imbecillity; ſo that every thing was governed either by corrupt miniſters or an imperious queen, who engaged the nation in foreign connections entirely contrary to its intereſts; while on the other hand, the true heir of the crown was a prince of approved judgment and experience, and a native of England, who, by his reſtoration, would undoubtedly correct all thoſe abuſes of which there was now ſuch juſt reaſon to complain.

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In this diſpute it was evident that the houſe of York had the better in point of argument: nevertheleſs, as a prince of the houſe of Lancaſter was in immediate poſſeſſion of the throne, and could by no means be charged with any crime, the cauſe of the former was leſs generally intereſting; eſpecially as it muſt always have been uncertain, *a priori*, whether the Duke of York would have governed any better than King Henry. After his return from Ireland, however, the former uſed all his power and influence to foment the diſcontents which had for ſome time prevailed in the kingdom; and the conduct of the next parliament manifeſted the ſucceſs of his intrigues. A violent attack was made upon ſuch noblemen as were known to be moſt in favour with the king. The houſe of commons preſented a petition againſt the Duke of Somerſet, the Ducheſs of Suffolk, the Biſhop of Cheſter, Lord Dudley, and ſeveral others of inferior rank; praying not only that the king would remove them from his council, but that he would prohibit them from coming within twelve miles of the court. Henry not daring to refuſe this petition altogether, conſented to baniſh all thoſe of inferior rank, whom the commons had ſpecified, but only for a year; and this too on condition that he had no uſe for their aſſiſtance in quelling any rebellion. But he rejected a bill for attainting the late Duke of Suffolk, and propoſed ſome other meaſures which ſeemed to militate againſt the court, though it had paſſed both the houſe of lords and the houſe of commons.

209 The Duke of York foments diſſenſions between the king and parliament.

Encouraged by this diſagreement between Henry

210 Richard raiſes an army;

211 But is obliged to retire.

212 He is appointed protector in conſequence of the king's illneſs.

213 Is depoſed and levies an army.

214 Hiſtory of the civil war between Henry and the Duke of York.

and his parliament, the Duke of York raiſed an army of 10,000 men, with whom he marched towards London, demanding a reformation in matters of government, and the removal of the Duke of Somerſet. This firſt enterpriſe, however, proved unſucceſsful; the gates of the city were ſhut againſt him, and he was purſued by the king at the head of a ſuperior army. On this he retired into Kent; and as there was a number of his own friends in the army of the king, a conference took place, in which Richard ſtill inſiſted upon the removal of the Duke of Somerſet, and his ſubmitting to be tried in parliament. This requeſt was in appearance complied with, and Somerſet arreſted: the Duke of York was then perſuaded to wait upon the king in his royal pavilion; but, on repeating his charge againſt the duke, he was ſurpriſed to ſee the latter come out from behind the curtain, and offer to maintain his innocence. Richard perceiving that he had not ſufficient intereſt to ruin his adverſary, pretended to be ſatisfied, and retired to his ſeat at Wigmore in Wales; and during the time he reſided there, a better opportunity was given him of accompliſhing his deſigns than he could have hoped for. The king fell into a kind of lethargic diſorder, which increaſed his natural imbecillity to ſuch a degree, that he could no longer retain a ſhadow of royalty. Richard now had intereſt enough to get himſelf appointed protector, with power to hold parliaments at pleaſure; with which high office he was no ſooner inveſted, than he turned out all the Lancaſtrian party from their offices, and ſent the Duke of Somerſet to the Tower: but on the recovery of the king, which happened in no long time after, he himſelf was diſmiſſed from his employment, the Duke of Somerſet releaſed, and the adminiſtration once more put into his hands. On this the duke of York levied an army, merely, as he pretended, to enforce the reformation of government and the removal of the Duke of Somerſet. Thus Henry, though ſore againſt his will, was obliged to face him in the field. A battle enſued at St Alban's; in which the royaliſts were defeated, and the Duke of Somerſet, the chief partiſan of their cauſe, killed in the action. The king himſelf was wounded, and took ſhelter in a cottage near the field of battle; where he was taken priſoner, but was afterwards treated with great reſpect and kindneſs by the Duke of York.

Henry, though he was now only a priſoner treated with the forms of royalty, was nevertheleſs pleaſed with his ſituation; but his queen, a woman of a bold and maſculine ſpirit, could not bear to have only the appearance of authority, while others enjoyed all the real power. She therefore excited the king once more to aſſert his right by force of arms; and after ſeveral manœuvres, the Duke of York was obliged to retire from court. A negociation for peace was at firſt ſet on foot, but the mutual diſtruſts of both parties ſoon broke it off. The armies met at Bloreheath on the borders of Staffordſhire, on the 23d of September 1459; and the Yorkiſts at firſt gained ſome advantages. But when a more general engagement was about to enſue, a body of veterans who ſerved under the Duke of York deſerted to the king; and this ſo intimidated the duke's party, that they ſeparated the next day without ſtriking a blow. The Duke of York fled to Ireland; and the Earl of Warwick, one of his ableſt and beſt ſupporters, eſcaped to Calais, with the government of which he had been entruſted during the late protectorſhip.

The York party, though thus in appearance ſuppreſſed, only waited a favourable opportunity of retrieving their affairs. Nor was this opportunity long wanting. Warwick having met with ſome ſucceſſes at ſea, landed in Kent; and being there joined by other barons, marched up to London amidſt the acclamations of the people. The city immediately opened its gates to him, and he ſoon found himſelf in a condition to face the royal army. An engagement enſued at Northampton on the 10th of July 1460; in which the royaliſts were entirely defeated, and the king again taken priſoner. The Duke of York then openly laid claim to the crown; and on this occaſion the firſt inſtance of a ſpirit of national liberty is ſaid to have appeared in the Houſe of Lords. The cauſe of Henry and the Duke of York was ſolemnly debated; and the latter, though a conqueror, did not abſolutely gain his cauſe. It was determined that Henry ſhould poſſeſs the throne during his life; and that the Duke of York ſhould be appointed his ſucceſſor, to the utter excluſion of the Prince of Wales, who was then a child.

215 Duke o York k ed.

Though the royal party now ſeemed deſtitute of every reſource, the queen ſtill retained her intrepidity. She fled into Wales, where ſhe endeavoured to raiſe another army. The northern barons, provoked at the ſouthern ones for ſettling the government and ſucceſſion to the crown without their conſent, ſoon furniſhed her with an army of 20,000 men. Another battle was fought near Wakefield Green, on the 24th of December 1460. The Yorkiſts were defeated, and the duke himſelf was killed in the action. His head was afterwards cut off by the queen's orders, and fixed on one of the gates of York, with a paper-crown, in deriſion of his pretended title. His ſon the Earl of Rutland, a youth of 17, was taken priſoner, and killed in cold blood by Lord Clifford, in revenge for his father's death, who had fallen in the battle of St Alban's.

After this victory, Margaret marched towards London, in order to ſet the king at liberty: but the Earl of Warwick, who now put himſelf at the head of the Yorkiſts, led about the captive king, in order to give a ſanction to his proceedings. He engaged the queen's forces at St Alban's; but through the treachery of Lord Lovelace, who deſerted during the heat of the engagement with a conſiderable body of forces, Warwick was defeated, and the king fell once more into the hands of his own party.

The ſubmiſſion of the city of London ſeemed now to be the only thing wanting to complete the queen's ſucceſs; but Warwick had ſecured it in his intereſts, and the citizens refuſed to open their gates to the queen. In the mean time, young Edward, eldeſt ſon of the late Duke of York, put himſelf at the head of his father's party. He was now in the bloom of youth, remarkable for the beauty of his perſon and his bravery, and was a great favourite of the people. He defeated Jaſper Tudor Earl of Pembroke, at Mortimer's croſs in Herefordſhire. The earl himſelf was taken priſoner, and immediately beheaded by Edward's orders.

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ders. After this, he advanced to London; and being joined by the remainder of Warwick's army, he ſoon obliged Margaret to retire, entered the city amidſt the acclamations of the people, and was crowned king on the 5th of March 1461.

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Notwithſtanding all her misfortunes, however, Margaret ſtill continued undaunted. She retired to the north, where ſhe was ſoon joined by ſuch numbers, that her army amounted to 60,000 men She was oppoſed by young Edward and Warwick at the head of 40,000; and both armies met near Touton in the county of York, on the 29th of March 1461. A bloody battle enſued, in which the queen's army was totally defeated; and as Edward, prompted by his natural cruelty, had ordered no quarter to be given, 40,000 of the Lancaſtrians were ſlain in the field or in the purſuit. Edward is ſaid to have gained this victory by means of a violent ſtorm of ſnow, which blew full in the face of the queen's army, and ſo blinded them that they could ſcarce make any uſe of their arms. After this diſaſter the queen fled to Scotland with her huſband and ſon; and notwithſtanding all the misfortunes ſhe had already met with, reſolved once more to enter England at the head of 5000 men granted her by the king of France. But even here ſhe was attended by her uſual bad fortune. Her little fleet was diſperſed by a tempeſt, and ſhe herſelf eſcaped with the utmoſt difficulty by entering the mouth of the Tweed. Soon after, a defeat, which her few forces ſuſtained at Hexham, ſeemed to render her cauſe entirely deſperate; and the cruelties practiſed upon all her adherents rendered it very dangerous to befriend her.

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By theſe repeated misfortunes the houſe of Lancaſter was ſo effectually ruined, that Margaret was obliged to ſeparate from her huſband, and both of them to ſhift for themſelves the beſt way they could. The king was ſtill protected by ſome of his friends, who conveyed him to Lancaſhire, where he remained in ſafety for a twelvemonth; but being at laſt diſcovered, he was thrown into the Tower and kept cloſe priſoner. The queen fled with her ſon to a foreſt, where ſhe was ſet upon by robbers, who ſtripped her of her rings and jewels, treating her otherwiſe with the utmoſt indignity. A quarrel which happened among them about the diviſion of the ſpoil afforded her an opportunity of eſcaping from their hands into another part of the foreſt, where ſhe wandered for ſome time without knowing what to do. At laſt, when quite ſpent with hunger and fatigue, ſhe ſaw a robber coming up to her with a drawn ſword in his hand. Finding it altogether impoſſible to eſcape, ſhe ſuddenly took the reſolution of putting herſelf under his protection. Advancing towards him, therefore, and preſenting the young prince, "Here (ſays ſhe), my friend, I commit to your care the ſafety of your king's ſon." This addreſs ſo much ſurpriſed the robber, that, inſtead of offering her any injury, he profeſſed himſelf entirely devoted to her ſervice. After living for ſome time concealed in the foreſt, ſhe was at laſt conducted to the ſea-ſide, where ſhe found a ſhip which conveyed her to Flanders. On her arrival there, ſhe went to her father's houſe, who, though very poor, gave her ſuch entertainment as he could afford; and in this retreat ſhe ſtaid ſome years in expectation of finding an opportunity of retrieving her affairs.

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Warwick
diſguſted by
Edward.

221
The king's
brother
joins in the
conſpiracy
againſt him.

222
An inſurrection in
Yorkſhire,

Edward, in the mean time, thinking himſelf ſecurely fixed on the throne, gave a looſe to his favourite paſſions; one of which was an immoderate love of women. To divert him from this, the Earl of Warwick, to whom he was indebted for his crown, adviſed him to marry. Edward conſented, and ſent him over to the continent to negociate a match with the princeſs of Savoy. The negociation proved ſucceſsful; but, in the mean time, the king had privately eſpouſed Elizabeth Woodville, daughter of Sir Philip Woodville, who had married the Ducheſs of Bedford after the death of her firſt huſband. Edward had employed his arts of ſeduction againſt this lady in vain before he married her; but unfortunately the match was concluded juſt at the time that the Earl of Warwick had proved ſucceſsful in his negociation with the princeſs of Savoy. The miniſter therefore returned full of indignation againſt his ſovereign: and Edward, forgetting how great cauſe he had to be offended, determined to remove him entirely from his councils. Warwick was likewiſe diſguſted by the favour ſhown to the queen's party; which, though certainly a piece of very commendable policy in Edward, was entirely diſagreeable to the ambitious diſpoſition of that nobleman. A plan of revenge was therefore thought of; and a moſt powerful combination was formed againſt Edward: to accompliſh which, Warwick not only employed his own influence, which was very extenſive, but likewiſe that of the Duke of Clarence, Edward's brother, to whom the earl had allied himſelf by giving him his daughter in marriage; after which he perſuaded him to embrace his cauſe. Some circumſtances which took place about this time alſo favoured the ſcheme. The inhabitants about St Leonard's in Yorkſhire complained, that the duties levied for that inſtitution, and which had been originally appointed for pious purpoſes, were ſecreted by the managers, who refuſed to contribute their part. As the clergy were concerned in this affair, they attempted to ſilence their antagoniſts by eccleſiaſtical fulminations againſt them; upon which the latter took up arms, fell upon the officers of the hoſpital, and having maſſacred them, proceeded towards York, to the number of 15,000. In the firſt ſkirmiſh, they had the misfortune to loſe their leader, who was inſtantly executed. The rebels, however, ſtill continued in arms, and in a ſhort time appeared in ſuch numbers as to become formidable to government. Henry Earl of Pembroke was ſent againſt them with a body of 5000 men; and having taken Sir Henry Nevil, one of the leaders of the inſurgents, priſoner, inſtantly put him to death; but this was ſoon revenged by a ſimilar execution on himſelf, who happened to be defeated and taken priſoner a ſhort time after This defeat had been occaſioned by a diſagreement betwixt the Earls of Pembroke and Devonſhire; in conſequence of which the latter had gone off with his troops, leaving Pembroke to ſhift for himſelf the beſt way he could. The king, enraged at this, cauſed Devonſhire to be executed in a like ſummary manner: but this was of no ſervice to his cauſe; a new body of inſurgents appeared under Sir Robert Welles, ſon to a nobleman of that name. The latter, in order to ſecure himſelf from all ſuſpicions of diſloyalty, fled to a monaſtery; but he was ſoon enticed from thence and put to death by the inſidious promiſes of king Edward, whoſe treachery was equal to his cruelty. His ſon ſoon after ſhared the ſame fate, being defeated and taken priſoner by Edward, who inſtantly ordered him to be beheaded, along with Sir Thomas Launde and other perſons of diſtinction.

223
Warwick and Clarence join the inſurgents.

Notwithſtanding ſuch an appearance of a general inſurrection, the king had ſo little ſuſpicion of the loyalty of Warwick and Clarence, that he employed them in raiſing troops to quell the inſurgents. Inſtead of executing their commiſſion with fidelity, however, they joined the malecontents with all the forces they could raiſe; but being quite diſconcerted by the defeat and death of Sir Robert Welles, they retired to Lancaſhire, in hopes of being joined by Lord Stanley, who had married the Earl of Warwick's ſiſter. Being diſappointed in this, they were obliged to diſband their army, and fly into Devonſhire, whence they ſet ſail for Calais. Upon their arrival on the continent, matters ſeemed not to be much mended: the deputy-governor, whom Warwick had left, refuſed him admittance; nor would he even allow the Ducheſs of Clarence to land, though ſhe had been delivered of a ſon on board only a very few days before, and was at that time extremely ill. Being well acquainted, however, with the uncertainty of the affairs of England at that time, he afterwards made an apology to Warwick for this behaviour. The latter pretended to be eaſily reconciled; but immediately left the place, having ſeized ſome Flemiſh veſſels which he found lying in the neighbourhood.

224
Reconciliation betwixt Warwick and the queen

As a very cloſe alliance ſubſiſted between Warwick and the Duke of Burgundy, the king of France became uneaſy; and therefore, as ſoon as the earl landed on his dominions, received him with the greateſt marks of eſteem. The reconciliation betwixt him and the unfortunate Queen Margaret now ſeemed to be natural, though, conſidering all circumſtances, this muſt have formerly appeared in a manner impoſſible. The earl's father had been put to death by the orders of Margaret; and Warwick, in return, had twice taken priſoner King Henry, baniſhed the queen, and put to death almoſt all their faithful adherents. By the mediation of the French monarch, however, all differences were accommodated. A fleet was prepared to reconduct them to England; and ſeizing a proper opportunity, they landed at Dartmouth with a ſmall body of troops, while Edward was in the north ſuppreſſing an inſurrection which had lately appeared there. Warwick was attended with aſtoniſhing ſucceſs on his arrival in England, and in leſs than ſix days ſaw himſelf at the head of 60,000 men. Edward was now obliged in his turn to fly the kingdom. Having narrowly eſcaped an attempt made upon his perſon by the Marquis of Montague, he embarked on board a ſmall fleet which lay off Lynn in Norfolk. While at ſea, he was chaſed by ſome ſhips belonging to the Hans Towns that were then at war both with France and England; but at length, having eſcaped all dangers, Edward landed ſafely in Holland, where he met with but an indifferent reception from the Duke of Burgundy, with whom he had lately entered into an alliance.

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He lands in England.

Warwick in the mean time advanced to London, and once more releaſed and placed on the throne the miſerable king Henry VI. A parliament was called, which very ſolemnly confirmed Henry's title to the throne, and Warwick himſelf was dignified by the people with the title of the *king maker*. All the attainders of the Lancaſtrians were reverſed; and every one was reſtored who had loſt either honours or fortune by his former adherence to Henry's cauſe. All the adherents of Edward fled to the continent, or took ſhelter in monaſteries, where they were protected by the eccleſiaſtical privileges. But Edward's party was not yet deſtroyed. After an abſence of nine months, being ſeconded by a ſmall body of troops granted him by the Duke of Burgundy, he made a deſcent at Ravenſpur in Yorkſhire. At firſt he met with little ſucceſs; but his army increaſing on his march, he was ſoon in a condition to appear before the capital, which immediately opened its gates.

The unfortunate Henry was thus again plucked from the throne; and the hopes of Warwick were almoſt totally blaſted by the defection of Clarence, Edward's brother. Nothing now remained but to come to an engagement as ſoon as poſſible. Warwick knew his forces to be inferior to thoſe of Edward, but placed great dependence on his own generalſhip. He therefore advanced to Barnet, within ten miles of London, where he reſolved to wait the coming of Edward. The latter ſoon came up with him, and on the 14th of April 1471, a moſt obſtinate and bloody battle was fought. Edward, according to cuſtom, had ordered no quarter to be given; and obtained the victory through a miſtake of a body of Warwick's forces, who fell with fury on their own party inſtead of the enemy. The earl himſelf was ſlain, together with his brother, and 10,000 of his braveſt followers.

The queen was juſt then returned with her ſon from France, where ſhe had been ſoliciting ſupplies. She had ſcarce time to refreſh herſelf from the fatigues of the voyage, when ſhe received the fatal news of the death of Warwick, and the total deſtruction of her party. All her reſolution was not able to ſupport her under ſuch a terrible diſaſter. Her grief now for the firſt time, it is ſaid, manifeſted itſelf by her tears; and ſhe immediately took ſanctuary in the abbey of Beaulieu in Hampſhire. Here ſhe ſtill found ſome friends willing to aſſiſt her. Tudor Earl of Pembroke, Courtney Earl of Devonſhire, the Lords Wenlock and St John, with ſome other men of rank, encouraged her yet to hope for ſucceſs, and promiſed to ſtand by her to the laſt. On this aſſurance, ſhe reſumed her courage; and advancing through the counties of Devon, Somerſet, and Gloceſter, increaſed her army every day. At laſt, however, ſhe was overtaken by Edward with his victorious army at Tewkeſbury, on the banks of the Severne. The Quen's army was totally defeated; the Earl of Devonſhire and Lord Wenlock were killed in the field; the Duke of Somerſet, and about 20 other perſons of diſtinction, who had taken ſhelter in a church, were ſurrounded, dragged out, and immediately beheaded; about 3000 of their party fell in battle, and the army was entirely diſperſed. Queen Margaret and her ſon were taken priſoners, and brought to the king, who aſked the prince in an inſulting manner, how he dared to invade his dominions? The young prince replied, that he came thither to claim his juſt inheritance; upon which Edward ſtruck him on the face with his gauntlet. The Dukes of Clarence and Gloceſter, Lord Haſtings, and Sir Thomas Gray, taking this blow as a ſignal for farther violence, hurried the prince into the next apartment, and there diſpatched him with their

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their daggers. Margaret was thrown into the Tower along with her huſband Henry, who expired in that confinement a few days after. It was univerſally believed that he was murdered by the duke of Gloceſter, though of this there was no direct evidence. Margaret was ranſomed by the king of France for 50,000 crowns, and died a few years after in a moſt miſerable ſituation.

Edward being now freed from all his enemies, began to inflict puniſhment on thoſe who had formerly appeared againſt him. Among the cruelties he committed, that on his brother the duke of Clarence was the moſt remarkable. The king happening to be one day hunting in the park of Thomas Burdet, a ſervant of the duke killed a white buck which was a great favourite of the owner. Burdet, vexed at the loſs, broke out into a paſſion, and wiſhed the horns of the deer in the belly of the perſon who adviſed the king to that inſult. For this exclamation Burdet was tried for his life, and executed at Tyburn. The duke of Clarence exclaimed againſt the iniquity of this ſentence; upon which he was arraigned before the houſe of peers, found guilty, and condemned to death. The only favour granted him was to have the choice of his death; and his choice was a very ſingular one, namely, to be drowned in a butt of Malmſey wine; which was accordingly done.—The reſt of this reign affords little elſe than an hiſtory of the king's amours Among his many miſtreſſes, Jane Shore was the moſt remarkable; (ſee SHORE.) The king died on the 9th of April 1482, in the 42d year of his age, and 21ſt of his reign, counting from his firſt aſſuming the crown. Beſides five daughters, he left two ſons; Edward prince of Wales, his ſucceſſor, then in his 13th year; and Richard duke of York in his 9th.

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On the death of Edward IV. the kingdom was divided into two new factions. The queen's family, which during the laſt reign had come into power, was become obnoxious to the old nobility, who conſidered them as their inferiors. The king had endeavoured to prevent theſe animoſities from coming to a height, by deſiring on his death-bed that his brother Richard duke of Gloceſter ſhould be entruſted with the regency; and recommended peace and unanimity during the minority of his ſon. But the king was no ſooner dead than the former reſentment between theſe parties broke out with violence; and the duke of Gloceſter, who was endued with almoſt every bad quality, reſolved to profit by their contentions. His firſt ſtep was to get himſelf declared protector of the realm; and having arreſted the earl of Rivers, the king's uncle and guardian, he met young Edward in his way from Ludlow caſtle, where the late king had reſided during the latter part of his reign, and reſpectfully offered to conduct him to London. Having thus ſecured the perſon of the king, he next got poſſeſſion of his brother's perſon alſo. The queen had retired with this child into Weſtminſter abbey; and it was not without extreme regret that ſhe delivered him up at the interceſſion of the primate and archbiſhop of York.

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In a few days after Gloceſter had made himſelf maſter of the perſons of the two princes, he had them confined in the Tower, under pretence of guarding them from danger; and ſoon after ſpread reports of their illegitimacy, and by pretended obſtacles put off the young king's coronation. Lord Stanley firſt began to ſuſpect his deſigns; and communicated his ſuſpicions to lord Haſtings, who had long been firmly attached to the king's family. Lord Haſtings would not at firſt give credit to this ſurmiſe; but he very ſoon had a fatal proof of the truth of what had been communicated to him. On the 13th of June 1483, he was hurried out of the council-room in the Tower by Gloceſter's order, and beheaded on a log of timber. The ſoldiers who carried him off made a buſtle as though an attempt had been made to reſcue him, and one of them diſcharged a blow at Lord Stanley's head with a pole-ax; but he happily eſcaped by ſhrinking under the table. The ſame day were executed the Earl Rivers, and ſome others, who had committed no other crime than being faithful to the young king.

The protector now thought he might with ſafety lay claim to the throne. He had previouſly gained over the duke of Buckingham, a nobleman of great influence among the people. He uſed his utmoſt endeavours to inſpire the people with a notion of the illegitimate birth of the late king, and conſequently of his children. Dr Shaw, a popular preacher, was alſo hired to harangue the people to the ſame purpoſe from St Paul's croſs. Having expatiated on the incontinence of the queen, and the illegality of the young king's title, he then made a panegyric on the virtues of the protector. “It is the protector (continued he) who carries in his face the image of virtue, and the marks of a true deſcent. He alone can reſtore the loſt glory and honour of the nation.” It was hoped that upon this occaſion ſome of the populace would have cried out, “Long live King Richard!” but the audience remaining ſilent, the duke of Buckingham undertook in his turn to perſuade them. Having expatiated on the calamities of the laſt reign and the illegitimacy of the preſent race, he told the people, that he ſaw only one method of warding off the miſeries which threatened the ſtate, which was by electing the protector; but he ſeemed apprehenſive that he would never be prevailed upon to accept a crown accompanied with ſuch difficulty and danger. He next aſked his auditors, whether they would have the protector for their king? but was mortified to find that a total ſilence enſued. The mayor, who was in the ſecret, willing to relieve him in this embarraſſed ſituation, obſerved, that the citizens were not accuſtomed to be harangued by a man of his quality, and would only give an anſwer to their recorder. This officer, therefore, repeated the duke's ſpeech; but the people continuing ſtill ſilent, “This is ſtrange obſtinacy (cried the duke): we only require of you, in plain terms, to declare, whether or not you will have the duke of Gloceſter for your king; as the lords and commons have ſufficient power without your concurrence?” At this, ſome of the meaneſt apprentices, incited by the ſervants of the protector and Buckingham, raiſed a feeble cry of “God ſave King Richard!” The mob at the door repeated the cry; and throwing up their caps into the air, cried out, “A Richard! A Richard!” After this farce was acted, Buckingham, on the 24th of June 1483, waited on Richard with offers of the crown: but the protector, with hypocritical modeſty, at firſt declined the offer; till being told, that the people, in caſe of his refuſal, muſt look out for one that would be more compliant,

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Richard III.

he accepted the government of England and France, with a reſolution, as he ſaid, to defend the one and ſubdue the other.

231
Edward V. and his brother murdered.

The firſt ſtep taken by the new king was to ſend orders to Sir Robert Brackenbury governor of the Tower, to put the young princes to death. But this he refuſed; and ſubmiſſively anſwered, that he knew not how to embrue his hands in innocent blood. A fit inſtrument for this purpoſe, however, was not long wanting. Sir James Tyrrel readily undertook the office; and Brackenbury was ordered to reſign the keys to him for one night. Tyrrel chooſing three aſſociates, Slater, Deighton, and Foreſt, came in the night-time to the door of the chamber where the princes were lodged; and ſending in the aſſaſſins, bid them execute their commiſſion, while he himſelf ſtaid without. They found the young princes in bed, and fallen into a ſound ſleep. The aſſaſſins ſmothered them with the bolſter and pillows; after which they ſhowed their naked bodies to Tyrrel, who ordered them to be buried at the ſtair-foot under an heap of ſtones (c.)

232
Buckingham determines to ſupport the claim of the Earl of Richmond to the throne.

Richard having thus ſecured himſelf on the throne by the moſt iniquitous methods, attempted to ſtrengthen his intereſt by foreign alliances, and procuring the favour of the clergy at home by great indulgences; but he found his power threatened from a quarter where he leaſt expected an attack. The duke of Buckingham, who had been ſo inſtrumental in raiſing him to the throne, did not think himſelf properly rewarded. He made a demand of ſome confiſcated lands in Hereford, to which his family had an ancient claim. Richard either reluctantly complied with his requeſt, or only granted it in part; ſo that a coolneſs ſoon enſued between them, and in a little time Buckingham came to a reſolution of dethroning the monarch whom he had juſt raiſed. For ſome time he remained in doubt, whether he ſhould aſſume the crown himſelf or ſet up another. At length he determined on the latter; and reſolved to declare for Henry earl of Richmond, who was at that time an exile in Brittany, and was conſidered as the only ſurviving branch of the houſe of Lancaſter. He was one of thoſe who had the good fortune to eſcape the numerous maſſacres of the former reigns; but as he was a deſcendant of John of Gaunt by the female line, he was for that reaſon obnoxious to thoſe in power. He had long lived in exile, and was once delivered over to the ambaſſadors of Edward IV. who were preparing to carry him to England; when the duke of Brittany, who delivered him, repented of what he had done, and took him from the ambaſſadors juſt as they were carrying him on ſhipboard. His right to the crown by ſucceſſion was very doubtful: but the cruel behaviour of Richard inclined the people in general greatly to favour him; and, to give an additional ſtrength to his title, a match was projected betwixt him and the princeſs Elizabeth, the eldeſt daughter of Edward IV. which, by uniting the two rival families, would put an end to thoſe diſſenſions which had ſo long filled the kingdom with bloodſhed and confuſion. Richard, in the mean time, from ſome reaſons which have not been particularized by hiſtorians, began to entertain doubts of the fidelity of Buckingham, and determined to cut him off. For this purpoſe he ſent for him to court: but Buckingham, inſtead of obeying the ſummons, fled into Wales, where he raiſed a conſiderable army, and forthwith ſet out to the eaſtward with a deſign to invade England. Richard haſtened to meet him with what forces he could raiſe; but the march of Buckingham being retarded by a moſt uncommon inundation of the Severn which laſted 10 days, his troops were ſo diſheartened at this event, that they almoſt all deſerted him. The duke was therefore obliged to fly in diſtreſs, and Richard inſtantly ſet a price upon his head. Buckingham was now obliged to truſt his life in the hands of an old ſervant of his own, named *Baniſter*; but this man, tempted by the greatneſs of the reward, betrayed him to the ſheriff of Shropſhire, by whom he was ſeized and conducted to Richard at Saliſbury, who cauſed him to be executed without delay. The earl of Richmond, in the mean time, had ſet ſail from St Maloes with a body of 5000 men: but after his arrival in England, receiving the diſagreeable news of Buckingham's misfortune, he ſet ſail again for Bretagne; while Richard, emboldened by the bad ſucceſs of his enemies, determined to confirm his title to the throne by calling a parliament, which till this time he had not ventured to do. At preſent, matters were ſo circumſtanced, that the parliament had no other reſource than to comply with his deſires, and acknowledge his right to the crown. An act was paſſed confirming the illegitimacy of Edward's children; and an attainder was alſo confirmed againſt the earl of Richmond; the duties of tonnage and poundage were granted to the king for life; and his only ſon Edward, then about 12 years of age, was created Prince of Wales. In return for theſe conceſſions, Richard paſſed ſeveral popular laws, particularly againſt the extorting of money by benevolences, and ſome others calculated to gain the good will of the oppoſite party. He paid his court alſo to the queen-dowager with ſuch aſſiduity and ſucceſs, that ſhe left her ſanctuary, and put herſelf and her daughters into his hands. The ambition and cruelty of this man indeed are ſaid to have extinguiſhed every ſentiment of natural affection as well as humanity. He had married Anne, the ſecond daughter of the earl of Warwick, and widow of Edward prince of Wales, whom he himſelf had murdered; but having born him but one ſon who died about this time, he conſidered her as an invincible obſtacle to the accompliſhment of his deſires; for which reaſon it was thought he put an end to her life by poiſon: and as he knew that the projected match between the earl of Richmond and the Princeſs Elizabeth could only make the rivalſhip of the former any way formidable, he reſolved to obtain a diſpenſation

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(c) Theſe circumſtances are ſaid to have been confeſſed in the ſucceeding reign, though the perpetrators eſcaped puniſhment. The bodies of the two princes were ſought for without any ſucceſs under the reign of Henry VII. but in the time of Charles V. the bones of two perſons anſwering to their age were found in the ſpot where they were ſaid to have been buried; which, being ſuppoſed to be the remains of theſe two unfortunate youths, they were buried under a marble monument in Weſtminſter abbey.

tion from the pope for marrying her himſelf. The queen-dowager is even ſaid to have come into this ſcheme with a view to recover her power; but the princeſs herſelf always rejected his addreſſes with abhorrence. The refuſal of the princeſs occaſioned no ſmall perplexity in Richard; and before he could determine on any proper method of accompliſhing his purpoſe, he received news of Richmond's preparations for landing in England. Theſe being ſoon accompliſhed, Henry ſet ſail from Harfleur in Normandy, and landed without oppoſition, on the 17th of Auguſt 1485, at Milford haven in Wales. Richard in the mean time, not knowing where the invaſion was to take place, had poſted himſelf at Nottingham; which being almoſt in the centre of the kingdom, was therefore proper for reſiſting any invader. Sir Rice ap Thomas and Sir Walter Herbert were commiſſioned by Richard to oppoſe his rival in Wales; but the former immediately deſerted to him, and the latter made but a very feeble reſiſtance. Richard inſtantly reſolved to meet his antagoniſt, and to riſk every thing on the event of a battle. Richmond, though he had not above 6000 men, and the king near double that number, did not decline the combat; being chiefly encouraged by the promiſes of Lord Stanley to join him with a body of 7000 men, and with whom he hovered at a little diſtance from the intended field of battle, ſeemingly indetermined to join either ſide.

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The king having commanded his army to form themſelves in order of battle, intruſted the van to the duke of Norfolk, while he himſelf, with the crown on his head, took the command of the main body. Lord Stanley in the mean time poſted himſelf on one flank between the two armies, while his brother Sir William took his ſtation directly oppoſite. As his intention of either joining the enemy or keeping neutral during the time of the engagement was now far from being doubtful, Richard ſent him orders to join the main body; which not being complied with, the tyrant determined to put to death Stanley's ſon, who had been left with him as a pledge of his father's fidelity. He was perſuaded, however, to defer the execution till after the engagement, that Stanley might thereby be induced to delay his purpoſe in joining the enemy. This, however, did not anſwer the expectation. Soon after the engagement was begun, Stanley deſerted Richard's party, and joining Richmond entirely decided the fortune of the day. The tyrant perceiving his ſituation to be quite deſperate, and ſeeing his rival at no great diſtance from him, drove up againſt him with fury, in hopes that either Henry's death or his own would decide the victory between them. He killed Sir William Brandon the earl's ſtandard-bearer; he diſmounted Sir John Cheyney; and was within reach of Richmond, when Sir William Stanley breaking in with his troops, Richard was ſurrounded and overwhelmed by numbers. His body was found in the field, covered with dead enemies, and beſmeared with blood. It was thrown careleſsly acroſs a horſe, carried to Leiceſter amidſt the ſhouts of inſulting ſpectators, and interred in the Gray-Friar's church of that place.

The uſurper's crown being found on the field of battle, was placed on the head of the conqueror, while the whole army cried out, "Long live king Henry!" Two days after the battle, Henry gave orders to confine Edward Plantagenet earl of Warwick, and ſon of the unfortunate duke of Clarence; and to releaſe the Princeſs Elizabeth, who had been confined in the Tower. He then advanced by ſlow and gradual marches to the city of London, where he was received with the greateſt demonſtrations of joy. He was crowned King of England on the 30th of October 1485; and, to heighten the ſplendor on that occaſion, he beſtowed the rank of knights-banneret on 12 perſons, and conferred peerages on three. Jaſper earl of Pembroke, his uncle, he created duke of Bedford; Thomas Lord Stanley his father-in-law, earl of Derby; and Edward Courtenay, Earl of Devonſhire. At the coronation likewiſe appeared a new inſtitution, which the king had eſtabliſhed for perſonal ſecurity as well as pomp; a band of 50 archers, who were denominated Yeomen of the Guard. But leſt the people ſhould take umbrage at this ſtep, as if it implied a diffidence of his ſubjects, he declared the inſtitution to be perpetual. The ceremony of the coronation was performed by Cardinal Bourchier archbiſhop of Canterbury.—On the 18th of January 1486, he was married to the Princeſs Elizabeth; and his marriage was celebrated at London with greater appearance of joy than either his firſt entry or his coronation had been. Henry remarked, with much diſpleaſure, this general favour borne to the houſe of York; and the ſuſpicions ariſing from it, not only diſturbed his tranquillity during the whole of his reign, but bred diſguſt towards his conſort herſelf, and poiſoned all his domeſtic enjoyments.

238 Henry VII.

The reign of Henry VII. was for ſeveral years diſturbed by plots and inſurrections. The people, by a long courſe of civil war, had become ſo turbulent and factious, that no governor could rule, nor could any king pleaſe them. The violent animoſity expreſſed by this monarch, however, againſt the houſe of York, may juſtly be conſidered as one of the cauſes of the extreme proneneſs to rebellion manifeſted by his ſubjects. Inſtead of endeavouring to conciliate the affections of the oppoſite party, he always ſtrove to quell them by abſolute force and violence. For this purpoſe he took a journey, ſoon after his acceſſion, to the north of England, where the Yorkiſts were very numerous; hoping to get the better of them by his preſence. In his journey thither, he received intelligence of an inſurrection againſt him by Viſcount Lovel, with Sir Henry Stafford, and Thomas his brother, who had raiſed an army, and were marching to beſiege the city of Worceſter, while Lovel approached to aſſiſt them with a body of three or four thouſand men. They were diſperſed, however, by the offer of a general pardon; which induced Lovel to withdraw from his troops, who were thereupon obliged to ſubmit to the king's mercy. The Staffords took ſanctuary in the church of Colnham near Abingdon; but as it was found that this church had not the privilege of protecting rebels, they were taken from thence: the elder was executed at Tyburn; but the younger, pleading that he had been miſled by his brother, received a pardon.

239 His reign diſturbed by frequent rebellions.

240 Lovel and Stafford's inſurrection ſuppreſſed.

241 Prince Arthur born.

This ſucceſs was ſoon after followed by the birth of a prince; whom Henry named in honour of the celebrated king Arthur, who is ſaid to have been the direct anceſtor of the houſe of Tudor. All this ſucceſs, however, as well as the general ſatisfaction which the birth of a prince deſcended from the houſes both of

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Diſcontents
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York and Lancaſter neceſſarily occaſioned, were not ſufficient to reconcile the hearts of the Engliſh to their ſovereign. His extreme ſeverity towards the houſe of York ſtill continued; and unfortunately this was much more beloved by the generality of the nation, than that of Lancaſter. Many of the Yorkiſts had been treated with great cruelty, and deprived of their fortunes under pretence of treaſon; a general reſumption had likewiſe been made of the grants made by the princes of the houſe of York. It was likewiſe univerſally believed that the queen herſelf met with harſh treatment, on account of her being one of that unfortunate houſe; and, from all theſe circumſtances, it was not unreaſonably imagined that his enmity was inveterate and invincible. Hence, nothwithſtanding his politic and vigorous adminiſtration, people made no ſcruple of openly expreſſing their diſapprobation of his conduct and government; and one rebellion ſeemed to be extinguiſhed only to give birth to another.

243
Impoſture
of Robert
Simnel.

The king had, at the commencement of his reign, confined the duke of Clarence's ſon, as has already been mentioned. This unfortunate youth, who had obtained the title of the earl of Warwick, was, through long confinement, entirely unacquainted with the affairs of the world. Simple as he was, however, he was now made uſe of to diſturb the public tranquillity. The queen-dowager was with great reaſon ſuſpected to be at the bottom of this conſpiracy; but not chooſing to interfere openly in the matter herſelf, ſhe employed one Simon a prieſt of Oxford to execute her purpoſes. This man caſt his eyes upon one Lambert Simnel a baker's ſon in the ſame place, a youth of only 15 years of age; but who, from his graceful appearance and accompliſhments, ſeemed proper for perſonating a man of quality. A report had been ſpread among the people, that Richard duke of York, ſecond ſon of Edward IV. had ſecretly made his eſcape from the cruelty of his uncle, and lay ſomewhere concealed in England. Simon had at firſt inſtructed his pupil to aſſume that name, which he found to be much the object of public affection; but hearing aferwards a new report, that Warwick had eſcaped from the Tower, and obſerving that this news was attended with no leſs general ſatiſfaction, he changed the plan of his impoſture, and made Simnel perſonate that unfortunate prince. The pliant youth was therefore directed by his inſtructor to talk upon many occurrences, as happening to him in the court of Edward. But as the impoſture was not calculated to bear a cloſe examination, he was removed to Ireland; and ſo well had he profited by the leſſons given him, that he no ſooner preſented himſelf to the earl of Kildare the deputy, claiming his protection as the unfortunate earl of Warwick, than he began to conſult with ſeveral other noblemen with regard to him. Theſe expreſſed even a ſtronger belief in Simnel's ſtory than the deputy himſelf had done; and in proportion as the ſtory was ſpread abroad, the more credit it obtained. The impoſtor was lodged in the caſtle of Dublin; the inhabitants univerſally took an oath of allegiance to him, as the true deſcendant of the Plantagenets; he was crowned with a diadem taken from the ſtatue of the bleſſed virgin, and proclaimed king by the title of Edward VI.; and the whole kingdom followed the example of the capital.

Such an unexpected event alarmed Henry ſo much, that he would have gone over to Ireland on purpoſe to quell the rebellion in perſon, had he not been afraid of the machinations of the queen-dowager in his abſence.

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To prevent any thing of this kind, it was reſolved to confine her for life in a monaſtery; under pretence, however, that it was done on account of her having formerly delivered up the princeſs her daughter to King Richard. The queen murmured againſt the ſeverity of her treatment; but the king perſiſted in his reſolution, and ſhe remained in confinement till the time of her death, which happened ſome years after.

The next meaſure was to ſhow Warwick to the people. He was taken from the Tower, and led thro' the principal ſtreets of London; after which he was conducted in ſolemn proceſſion to St Paul's, where great numbers were aſſembled to ſee him. Still, however, they proceeded in Dublin to honour their pretended monarch; and he was crowned with great ſolemnity in the preſence of the earl of Kildare, the chancellor, and the other officers of ſtate. At laſt, being furniſhed by the ducheſs of Burgundy with a body of 2000 veteran Germans under the command of Martin Swart, a brave and experienced officer, he reſolved to invade England. He landed in Lancaſhire, from whence he marched to York, expecting that the country-people would riſe and join him on his march. But in this he was deceived: the people were unwilling to join a body of foreigners; and were beſides kept in awe by the great reputation of Henry. Lord Lincoln, therefore, who commanded the rebel army, determined to bring the matter to a ſpeedy iſſue. Accordingly he met the royal army at Stoke in the county of Nottingham. An obſtinate engagement enſued, but at length King Henry obtained a complete victory. Lord Lincoln, with 4000 private men, periſhed in the battle; and Simnel with his tutor Simon were taken priſoners. Simon being a prieſt, could not be tried by the civil power, and was only committed to cloſe confinement. Simnel was pardoned, and made a ſcullion in the king's kitchen, whence he was afterwards advanced to the rank of falconer, in which employment he died.

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Henry being now freed from all danger from that quarter, determined to take ample vengeance on his enemies. For this purpoſe he took a journey into the north; but though he found many delinquents, his natural avarice prompted him to exact heavy fines from them rather than to put them to death. His proceedings, however, were extremely arbitrary; the criminals being tried, not by the ordinary judges, but either by commiſſioners appointed for the occaſion, or ſuffering puniſhment by ſentence of a court-martial.

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Having thus fully eſtabliſhed his authority as far as it could be done by ſuppreſſing and puniſhing domeſtic enemies, he next determined to recommend himſelf to his ſubjects by a report of his military diſpoſition; hoping, that by undertaking, or pretending to undertake, ſome martial enterpriſes, he would thus gain the favour of a people naturally turbulent, and unaccuſtomed to live long at peace with their neighbours. He certainly had not, however, the leaſt intention of proſecuting foreign conqueſts; though, to pleaſe the people, he frequently gave out that he deſigned to invade France, and lay waſte the whole country, rather than not recover his continental poſſeſſions. Under theſe pretences, particularly that of aſſiſting the Bretons whom the king of France had lately ſubdued, and who had applied to him for relief, he perſuaded his parliament to grant him a conſiderable ſupply; but this involved him in ſome difficulties. The counties of Durham and York, who had always been diſcontented with Henry's government, and ſtill farther provoked by the oppreſſions under which they had laboured after the extinction of Simnel's rebellion, oppoſed the commiſſioners ſent by the king to levy the tax. The latter applied to the earl of Northumberlad, requeſting his advice and aſſiſtance in the execution of their office; but inſtead of being able to enforce the levying of the tax, he himſelf was attacked and put to death by the inſurgents. This act of violence committed by themſelves, ſeemed to render the inſurgents deſperate, ſo that without more ado they prepared to reſiſt the royal power, under the conduct of one Sir John Egremond; but in this ill-conducted and precipitate ſcheme they met with no ſucceſs. Henry inſtantly levied a conſiderable force, which he committed to the charge of the earl of Surrey; by whom the rebels were quickly defeated, and one of their leaders taken priſoner. Sir John Egremond fled to the ducheſs of Burgundy, who afforded him protection.

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Thus Henry obtained the ſubſidy which he had ſolicited under pretence of invading France, though he would willingly have avoided any expence in preparations for that purpoſe in order to keep the money in his poſſeſſion; but as the Bretons had applied to him for aſſiſtance, and their diſtreſſes became every day more urgent, he found himſelf obliged to attempt ſomething. With this view he ſet ſail for Calais with an army of 25,000 foot and 1600 horſe, of which he gave the command to the duke of Bedford and the earl of Oxford: but notwithſtanding this apparent hoſtile diſpoſition, negociations for peace had been ſecretly begun, and commiſſioners even appointed to conſider of the terms, three months before King Henry ſet out for the continent. As the love of money was the prevailing paſſion of the Engliſh monarch, and the poſſeſſion of Bretagne was a great object to France, an accommodation ſoon took place betwixt the contending parties. The king of France engaged to pay Henry near L.200,000 as a reimburſement for the expences of his expedition, and ſtipulated at the ſame time to pay him and his heirs an annual penſion of 25,000 crowns more.

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Thus the authority of Henry ſeemed to be ſo firmly eſtabliſhed, as to leave no reaſon to dread any rival in time to come; but ſtill he found himſelf miſtaken. The ducheſs of Burgundy, reſenting the depreſſion of her family, and exaſperated by her frequent miſcarriages in the attempts already made, reſolved to make a final effort againſt Henry, whom ſhe greatly hated. For this purpoſe, ſhe propagated a report that her nephew Richard Plantagenet, duke of York, had eſcaped from the Tower where his elder brother was murdered, and that he ſtill lay ſomewhere concealed. Finding this report eagerly received, ſhe ſoon found a young man who aſſumed both his name and character. The perſon choſen to act this part was the ſon of one Oſbeck, or Warbeck, a converted Jew, who had been in England during the reign of Edward IV. His name was *Peter*; but it had been corrupted after the Flemiſh manner into *Peterkin*, or *Perkin*. It was by ſome believed, that Edward, among his other amorous adventures, had a ſecret correſpondence with Warbeck's wife, which might account for the great ſimilarity of features between Perkin and that monarch. The ducheſs of Burgundy found this youth entirely ſuited to her purpoſes. The leſſons ſhe gave him were eaſily learned and ſtrongly retained. His graceful air, his courtly addreſs, his eaſy manners, and elegant converſation, were capable of impoſing upon all but thoſe who were privy to the impoſture. The kingdom of Ireland was pitched upon for Perkin's firſt appearance, as it had been before for that of Simnel. He landed at Cork; and immediately aſſuming the name of *Richard Plantagenet*, was followed by great numbers of credulous people. He wrote letters to the earls of Deſmond and Kildare, inviting them to join his party; he diſperſed every where the ſtrange intelligence of his eſcape from his uncle Richard's cruelty; and his ſtory meeting with general credit, he ſoon became an object of the public favour. All thoſe who were diſguſted with the king, prepared to join Perkin; but particularly thoſe who formerly were Henry's favourites, and had contributed to place him on the throne. Theſe, thinking their ſervices had not been ſufficiently repaid, now became heads of the conſpiracy. Their attempts, however, were all fruſtrated by the vigilance of the king, and moſt of the conſpirators of any note were publicly executed.

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Perkin finding it was in vain to attempt any thing in England, went to the court of James IV. of Scotland. Here he was received with great cordiality; and James carried his confidence in him ſo far, that he even gave him in marriage lady Catherine Gordon, daughter to the earl of Huntley, and a near kinſwoman of his own. But when he attempted to ſet him on the throne of England, he found himſelf totally diſappointed; and on the concluſion of peace between the two kingdoms, Perkin was obliged to leave Scotland. From thence he went to Flanders; and meeting with but a cool reception there, he reſolved to try the affections of the people of Cornwall, who had lately riſen againſt the king on account of a new tax which had been levied upon them. On his firſt appearance, Perkin was joined by about 3000 of theſe people, with which force he laid ſiege to Exeter. Henry, however, having marched againſt him with a conſiderable army, Perkin's heart failed him, though his followers now amounted to 7000; and he took ſhelter in a monaſtery. His wife fell into the conqueror's hands; who placed her in a reſpectable ſituation near the queen's perſon, with a ſuitable penſion, which ſhe enjoyed till her death. Perkin being perſuaded to deliver himſelf into the king's hand, was compelled to ſign a confeſſion of his former life and conduct; but this was ſo defective and contradictory, that very little regard was paid to it. His life was granted him; though he was ſtill detained in cuſtody, and keepers were appointed to watch his conduct. From theſe, however, he broke looſe; and flying to the ſanctuary of Shyne, put himſelf into the prior's hands. He was once more prevailed upon to truſt himſelf in the king's hands, and was committed to the Tower; but having here entered into a correſpondence with the earl of Warwick in order to make their eſcape, both of them were condemned and executed.

To Henry VII. in a great meaſure is owing the pre-

[251] Engliſh nation civilized by Henry.

preſent civilized ſtate of the Engliſh nation. He had all along two points principally in view; the one to depreſs the nobility and clergy, and the other to exalt and humanize the populace. In the feudal times every nobleman was poſſeſſed of a certain number of vaſſals, over whom he had, by various methods, acquired an almoſt abſolute power; and, therefore, upon every ſlight diſguſt, he was able to influence them to join him in his revolt or diſobedience. Henry conſidered, that the giving of his barons a power to ſell their eſtates, which were before unalienable, muſt greatly weaken their intereſt. This liberty therefore he gave them; and it proved highly pleaſing to the commons, nor was it diſagreeable to the nobles themſelves. His next ſcheme was to prevent their giving liveries to many hundreds of their dependents, who were thus kept like the ſoldiers of a ſtanding army to be ready at the command of their lord. By an act paſſed in this reign, none but menial ſervants were allowed to wear a livery; and this law was enforced under ſevere penalties.

With the clergy, Henry was not ſo ſucceſsful. The number of criminals of all kinds who found protection in monaſteries and other places appointed for religious worſhip, ſeemed to indicate little leſs than an abſolute toleration of all kinds of vice. Henry uſed all his intereſt with the pope to get theſe ſanctuaries aboliſhed, but to no purpoſe. All that he could procure was, that if thieves, murderers, or robbers, regiſtered as ſanctuary men, ſhould ſally out and commit freſh offences, and retreat again, in ſuch caſes they might be taken out of the ſanctuary and delivered up to juſtice.

In 1500, the king's eldeſt ſon Arthur was married to the Infanta Catharine of Spain, which marriage had been projected and negociated ſeven years. But the prince dying in a few months after marriage, the princeſs was obliged to marry his younger brother Henry, who was created Prince of Wales in his room. Henry himſelf made all the oppoſition which a youth of 12 years of age is capable of; but as the king perſiſted in his reſolution, the marriage was by the pope's diſpenſation ſhortly after ſolemnized.—In the latter part of this king's reign, his economy, which had always been exact, degenerated into avarice, and he oppreſſed the people in a very arbitrary manner. He had two miniſters, Empſon and Dudley, perfectly qualified to ſecond his avaricious intentions. They were both lawyers, and uſually committed to priſon by indictment ſuch perſons as they intended to oppreſs; from whence they ſeldom got free but by paying heavy fines, which were called mitigations and compoſitions: but by degrees the very forms of law were omitted; and they determined in a ſummary way upon the properties of the ſubjects, and confiſcated their effects to the
252 Death of Henry VII. royal treaſury.—Henry VII. died of the gout in his ſtomach, in the year 1509, having lived 52 years, and reigned 23; and was ſucceeded by his ſon Henry VIII. In Henry VII.'s reign was built a large ſhip of war called the *Great Harry*, which coſt L. 14,000. This was, properly ſpeaking, the firſt ſhip in the Engliſh navy. Before this period, when the king wanted a fleet, he had no other expedient than to hire ſhips from the merchants.

253 Henry VIII. Henry VIII. aſcended the throne when he was about 18 years of age, and had almoſt every advantage which a prince can have on his acceſſion. He had a well-ſtored treaſury, an indiſputed title, and was at peace with all the powers in Europe. Commerce and arts had been ſome time introduced into England, where they met with a favourable reception. The young prince himſelf was beautiful in his perſon, expert in all polite exerciſes, open and liberal in his air, and loved by all his ſubjects. The old king, who was himſelf a ſcholar, had inſtructed him in all the learning of the times, ſo that he was an adept in ſchool-divinity before the age of 18.

All theſe advantages, however, ſeemed to have been loſt upon the new king. Being deſtitute of a good heart and ſolid underſtanding, he proved a tyrant. Being always actuated not by reaſon but the paſſion which happened to be uppermoſt in his mind, he behaved in the moſt abſurd and contradictory manner; and however fortunate ſome of his meaſures proved at laſt, it is impoſſible that either his motives, or the means he took for the accompliſhment of his purpoſes, can be approved of by any good man.

One of Henry's firſt actions in his royal capacity was to puniſh Empſon and Dudley, who were obnoxious to the populace on account of their having been the inſtruments of the late king's rapacity. As they could not be impeached merely on account of their having ſtrictly executed the will of the king, they were accuſed of having entered into a treaſonable conſpiracy, and of having deſigned to ſeize by force the adminiſtration of government; and though nothing could be more improbable than ſuch a charge, the general prejudice againſt them was ſo great, that they were both condemned and executed.

In 1510, the king entered into a league with pope Julius II. and Ferdinand king of Spain, againſt Louis XII. of France. In this alliance Henry was the only diſintereſted perſon. He expected nothing beſides the glory which he hoped would attend his arms, and the title of *Moſt Chriſtian King*, which the pope aſſured him would ſoon be taken from the king of France to be conferred upon him. The pope was deſirous of wreſting from Louis ſome valuable provinces which he poſſeſſed in Italy, and Ferdinand was deſirous of ſharing in the ſpoil. Henry ſummoned his parliament; who very readily granted him ſupplies, as he gave out that his deſign was to conquer the kingdom of France, and annex it to the crown of England. It was in vain that one of his old prudent counſellors objected, that conqueſts on the continent would only drain the kingdom without enriching it; and that England, from its ſituation, was not fitted to enjoy extenſive empire. The young king, deaf to all remonſtrances, and hurried away by his military ardour, reſolved imediately to begin the war. But after ſeveral attempts, which were rendered unſucceſsful only by the miſmanagement of thoſe who conducted them, a peace was concluded with France on the 7th of Auguſt 1514.

Henry's arms were attended with more ſucceſs in Scotland; where King James IV. with the greateſt part of the Scot's nobility, and 10,000 of the common people, were cut off in the battle of Flowden*. Henry in the mean time, puffed up with his imaginary ſucceſſes againſt France, and his real ones againſt Scotland,

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land, continued to laviſh his treaſures by expenſive pleaſures and no leſs expenſive preparations for war. The old miniſters who had been appointed by his father to direct him, were now diſregarded; and the king's confidence was entirely placed in Thomas afterwards Cardinal Wolſey, who ſeconded him in all his favourite purſuits, and who, being the ſon of a private gentleman at Ipſwich, had gradually raiſed himſelf to the firſt employments of the ſtate*. He doth not ſeem to have had many bad qualities beſides his exceſſive pride, which diſguſted all the nobility; but the great ſhare he poſſeſſed in the favour of ſuch an abſolute prince as Henry VIII. put him quite out of the reach his enemies.

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The king having ſoon exhauſted all the treaſures left him by his father, as well as the ſupplies which he could by fair means obtain from his parliament, applied to Wolſey for new methods of repleniſhing his coffers. The miniſter's firſt ſcheme was to get a large ſum from the people under the title of *benevolence;* though no title could be more improperly applied, as it was not granted without the greateſt murmurings and complaints. Wolſey even met with oppoſition in the levying of it. In the firſt place, having exacted a conſiderable ſum from the clergy, he next applied himſelf to the houſe of commons; but they only granted him half the ſum he demanded. The miniſter at firſt was highly offended, and deſired to be heard in the houſe; but they replied, that none could be permitted to ſit and argue there except ſuch as were members. Soon after, the king having occaſion for new ſupplies, by Wolſey's advice attempted to procure them by his prerogative alone, without conſulting his parliament. He iſſued out commiſſions to all the counties of England for levying four ſhillings in the pound from the clergy, and three ſhillings and fourpence from the laity. This ſtretch of royal power was ſoon oppoſed by the people, and a general inſurrection ſeemed ready to enſue. Henry endeavoured to pacify them by circular letters; in which he declared, that what he demanded was only by way of benevolence. The city of London, however, ſtill heſitated on the demand; and in ſome parts of the country inſurrections were actually begun. Theſe were happily ſuppreſſed by the duke of Suffolk; but the cardinal loſt ſomewhat of the king's favour on account of the improper advice he had given him. To reinſtate himſelf in his good graces, Wolſey made the king a preſent of a noble palace called *York-place*, at Weſtminſter, aſſuring him that from the firſt he had intended it for the king's uſe. In order to have a pretence for amaſſing more wealth, Wolſey next undertook to found two new colleges at Oxford; and for this pupoſe he received every day freſh grants from the pope and the king. The former imprudently gave him liberty to ſuppreſs ſome monaſteries, and make uſe of their revenues for the erection of his new colleges; but this was a fatal precedent for the pontiff's intereſts, as it taught the king to ſeize on the monaſtic revenues whenever he ſtood in need of money.

256
Cauſe of Wolſey's diſgrace.

257
Scruples concerning the legality of Henry's marriage.

For a conſiderable time Wolſey continued to enjoy the king's favour in an extreme degree; and as no monarch was ever more deſpotic than Henry VIII. no miniſter was ever more powerful than Wolſey. This extraordinary elevation ſerved only to render his fall the more conſpicuous, and himſelf the more miſerable, when it took place; and what was worſe, he had long foreſeen, from what he knew of the king's capricious and obſtinate temper, that it certainly would happen one time or other. The cauſe of his final overthrow was the deſire King Henry began to entertain of having his Queen Catherine divorced. The doctrines of the reformation, propagated by Luther in 1517, had gained conſiderable ground in England, and many profeſſed a belief in them, notwithſtanding the ſevere perſecution which had been carried on againſt heretics during ſome of the preceding reigns. The clergy had become ſo exceedingly corrupt, and were immerſed in ſuch monſtrous ignorance, that they were univerſally hated even by their own party, while no regard at all was paid to their deciſions, or rather they were looked upon with the utmoſt abhorrence, by the reformers. Even the papal authority, though ſtill very great, had, in no greater a ſpace of time than ten years (viz. from 1517, when Luther firſt began to attack it, to the preſent year 1527), declined very ſenſibly The marriage of King Henry therefore being in itſelf looked upon by all parties as illegal in itſelf, and only ſanctified by a diſpenſation from the pope, had been frequently objected to on different occaſions. We are informed by ſome authors, that when Henry VII. betrothed his ſon, at that time only 12 years of age, he evidently ſhowed an intention of taking afterwards a proper opportunity to annul the contract; and that he ordered Prince Henry, as ſoon as he ſhould come of age, to enter a proteſtation againſt the marriage; charging him on his death-bed not to finiſh an alliance ſo unuſual, and liable to ſuch inſuperable objections. Some members of the privy council, particularly Warham the primate, afterwards declared againſt the completion of the marriage; and even after it was completed, ſome incidents which in a ſhort time took place were ſufficient to make him ſenſible of the general ſentiments of the public on that ſubject. The ſtates of Caſtile had oppoſed a marriage betwixt the emperor Charles and the Engliſh princeſs Mary, Henry's daughter, urging among other things the illegitimacy of her birth. The ſame objection afterwards occurred on opening a negociation with France for a marriage with the duke of Orleans.

258
Other reaſons for Henry's deſire of a divorce.

259
His love for Anne Boleyn.

If theſe accounts are to be depended upon as authentic, we can ſcarce conceive it poſſible but Henry himſelf muſt have been ſomewhat ſtaggered by them; though it is by no means probable that they were his only motives. The queen was ſix years older than the king, her perſonal charms were decayed, and his affection leſſened in proportion. All her children had died in infancy except one daughter, the Princeſs Mary above mentioned; and Henry was, or pretended to be, greatly ſtruck with this, as it ſeemed ſomething like the curſe of being childleſs, pronounced in the Moſaic law againſt ſome evil-doers. Another point of the utmoſt importance was the ſucceſſion to the crown, which any queſtion concerning the legitimacy of the king's marriage would involve in confuſion. It was alſo ſuppoſed, with great reaſon, that ſhould any obſtacles of this kind occur, the king of Scotland would ſtep in as the next heir, and advance his pretenſions to the crown of England. But above all, it is probable that he was influenced by the love he had now contracted for Anne Boleyn, who had

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lately been appointed maid of honour to the queen. In this ſtation Henry had frequent opportunities of ſeeing her, and ſoon became deeply enamoured; and finding that his paſſion could not be gratified but by a marriage, it is not to be doubted that he was thus obſtinately ſet upon the divorce; for which purpoſe he ſent his ſecretary to Rome to obtain from Clement a bull for diſſolving his marriage with Catharine. That he might not ſeem to entertain any doubt of the pope's prerogative, he inſiſted only on ſome grounds of nullity in the bull granted by his predeceſſor Julius for the accompliſhment of the marriage. In the preamble to this bull, it had been ſaid, that it was granted only upon the ſolicitation of Henry himſelf; though it was known that he was then a youth under 12 years of age: it was likewiſe aſſerted, that the bull was neceſſary for maintaining the peace between the two crowns; though otherwiſe it is certain that there was no appearance of a quarrel betwixt them. Theſe falſe premiſes ſeemed to afford a very good pretence for diſſolving it; but, as matters then ſtood, the pope was involved in the utmoſt perplexity. Queen Catharine was aunt to the emperor, who had lately made Clement himſelf a priſoner, and whoſe reſentment he ſtill dreaded: and beſides, he could not with any degree of prudence declare the bull of the former pope illicit, as this would give a mortal blow to the doctrine of papal infallibility. On the other hand, Henry was his protector and friend; the dominions of England were the chief reſource from whence his finances were ſupplied; and the King of France, ſome time before, had got a bull of divorce in circumſtances nearly ſimilar. In this exigence he thought the wiſeſt method would be to ſpin out the affair by negociation; and in the mean time he ſent over a commiſſion to Wolſey, in conjunction with the archbiſhop of Canterbury or any other Engliſh prelate, to examine the validity of the king's marriage and of the former diſpenſation; granting them alſo a proviſional diſpenſation for the king's marriage with any other perſon.

260
Sends to Rome to obtain a divorce.

261
Extreme perplexity of the Pope.

The pope's meſſage was laid before the council in England: but they conſidered, that an advice given by the pope in this ſecret manner might very eaſily be diſavowed in public; and that a clandeſtine marriage would totally invalidate the legitimacy of any iſſue the king might have by ſuch a match. In conſequence of this, freſh meſſengers were diſpatched to Rome, and evaſive anſwers returned; the pope never imagining that Henry's paſſion would hold out during the tedious courſe of an eccleſiaſtical controverſy. But in this he was miſtaken. The king of England had been taught to diſpute as well as the pope, and valued himſelf not a little in his knowledge on theology: and to his arguments he added threats; telling him, that the Engliſh were but too well diſpoſed to withdraw from the holy ſee; and that if he continued uncomplying, the whole country would readily follow the example of their monarch, who ſhould always deny obedience to a pontiff that had treated him with ſuch falſehood and duplicity. The king even propoſed to his holineſs, whether, if he were not permitted to divorce his preſent queen, he might not have a diſpenſation for having two wives at once?

262
Henry's controverſy with him.

The pope, perceiving the king's eagerneſs, at laſt ſent Cardinal Campegio his legate to London; who, with Wolſey, opened a court for trying the legitimacy of the king's marriage with Catharine, and cited the king and queen to appear before them. The trial commenced the 31ſt of May 1529; and both parties preſented themſelves. The king anſwered to his name when called: but the queen, inſtead of anſwering to hers, roſe from her ſeat, and throwing herſelf at the king's feet, made a very pathetic harangue; which her dignity, her virtue, and misfortunes, rendered ſtill more affecting. She told her huſband, "That ſhe was a ſtranger in his dominions, without protection, without counſel, and without aſſiſtance; expoſed to all the injuſtice which her enemies were pleaſed to impoſe upon her: That ſhe had quitted her native country, without any other reſource than her connections with him and his family; and that, inſtead of ſuffering thence any violence or iniquity, ſhe had been aſſured of having in them a ſafeguard againſt every misfortune: That ſhe had been his wife during 20 years; and would here appeal to himſelf, whether her affectionate ſubmiſſion to his will had not merited other treatment than to be thus, after ſo long a time, thrown from him with indignity: That ſhe was conſcious,—he himſelf was aſſured,—that her virgin honour was yet unſtained when he received her into his bed; and that her connections with his brother had been carried no farther than the mere ceremony of marriage: That their parents, the kings of England and Spain, were eſteemed the wiſeſt princes of their time, and had undoubtedly acted by the beſt advice when they formed the agreement for that marriage, which was now repreſented as ſo criminal and unnatural: And that ſhe acquieſced in their judgment, and would not ſubmit her cauſe to be tried by a court whoſe dependence on her enemies was too viſible ever to allow her any hopes of obtaining from them an equitable or impartial deciſion." Having ſpoken theſe words, the queen roſe, and, making the king a low reverence, left the court; nor would ſhe ever again appear in it. The legate having again ſummoned the queen to appear before them, on her refuſal, declared her contumacious, and the trial proceeded in her abſence. But when the buſineſs ſeemed to be nearly decided, Campegio, on ſome very frivolous pretences, prorogued the court, and at laſt transferred the cauſe before the ſee of Rome.

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All this time Cardinal Wolſey ſeemed to be in the ſame dilemma with the pope, and indeed much worſe; as he could not boaſt of the ſame independence which his holineſs poſſeſſed. On the one hand, he was very ſolicitous to gratify the king his maſter, who had diſtinguiſhed him by ſo many and extraordinary marks of favour; on the other, he feared to offend the pope, whoſe ſervant he more immediately was, and who likewiſe had power to puniſh his diſobedience. He had long known that this affair was certainly to end in his ruin; and by attempting to pleaſe all parties, he fell under the diſpleaſure of every one; ſo that he was at laſt left without a ſingle friend in the world. The king was diſpleaſed on account of his not entering into his cauſe with the warmth he thought he had reaſon to expect; Anne Boleyn imputed to him the diſappointment of her hopes; while even queen Catharine and her friends expreſſed the greateſt indignation againſt him on account of the part he had openly taken in the affair of her divorce. In this miſerable ſituation the

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king ſent him a meſſage by the dukes of Norfolk and Suffolk, demanding the great ſeal: the cardinal refuſed to deliver it without a more expreſs warrant; upon which Henry wrote him a letter, and on receipt of this it was inſtantly given up. The ſeal was beſtowed on Sir Thomas More; a man who, beſides elegant literary talents, was poſſeſſed of the higheſt capacity, integrity, and virtue. Wolſey was next commanded to depart from York-place palace which he had built in London; and which, though it belonged to the ſee of York, was now ſeized by the king, and afterwards became the reſidence of the Britiſh ſovereigns, under the name of *Whitehall.* All his furniture and plate, the richneſs of which ſeemed rather proper for a monarch than a ſubject, was ſeized for the king's uſe. He was then commanded to retire to Eſher, a country-ſeat which he poſſeſſed near Hampton court, and there to wait the king's pleaſure. One diſgrace followed another; and his fall was at length completed by a ſummons to London to anſwer a charge of high-treaſon. This ſummons he at firſt refuſed to anſwer, as being a cardinal. However, being at length perſuaded, he ſet out on his journey; but was taken ill, and died by the way. See the article Wolsey.

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After the death of Wolſey, the king, by the advice of Cranmer*, had the legality of his marriage debated in all the univerſities of Europe; and the votes of theſe were obtained in his favour by dint of money. The deburſements made on the occaſion have even been preſerved to this day. To a ſubdeacon he gave a crown, to a deacon two crowns, and ſo to the reſt in proportion to the importance of their ſtation or opinion.—Being thus fortified by the opinions of the univerſities, and even of the Jewiſh rabbies (for them alſo he had conſulted), Henry began to think he might ſafely oppoſe the pope himſelf. He began by reviving in parliament an old law againſt the clergy, by which all thoſe who had ſubmitted to the authority of the pope's legate were condemned to ſevere penalties. The clergy, to conciliate the king's favour, were obliged to pay a fine of 118,000 pounds. A confeſſion was likewiſe extorted from them, that the king, and not the pope, was the ſupreme head of the church and clergy of England. An act was ſoon after paſſed againſt levying the firſt-fruits, or a year's rent of all the biſhoprics that fell vacant. After this the king privately married his beloved Anne Boleyn; and ſhe proving with child ſoon after marriage, he publicly owned her for his wife, and paſſed with her through London, with a greater magnificence than had ever been known before. The ſtreets were ſtrewed with flowers, the walls of the houſes hung with tapeſtry, and an univerſal joy ſeemed to be diffuſed among the people. The unfortunate queen Catharine, perceiving all further oppoſition to be vain, retired to Amphthill near Dunſtable, where ſhe continued the reſt of her days in privacy and peace. Her marriage with Henry was at laſt declared invalid, but not till after the latter had been married to Anne Boleyn, though this declaration ought undoubtedly to have preceded it. See Boleyn.

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The pope was no ſooner informed of theſe proceedings, than he paſſed a ſentence, declaring Catharine to be the king's only lawful wife; requiring him to take her again, and denouncing his cenſures againſt him in caſe of a refuſal. Henry, on the other hand, knowing that his ſubjects were entirely at his command, reſolved to ſeparate totally from the church of Rome. In the year 1534, he was declared head of the church by parliament; the authority of the pope was completely aboliſhed in England; all tributes formerly paid to the holy ſee were declared illegal; and the king was entruſted with the collation to all eccleſiaſtical benefices. The nation came into the king's meaſures with joy, and took an oath called the *oath of ſupremacy:* all the credit which the popes had maintained over England for ages, was now overthrown at once; and none ſeemed to repine at the change, except thoſe who were immediately intereſted by their dependence on Rome.

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church.

But though the king thus ſeparated from the church of Rome, he by no means adhered to the doctrines of Luther which had been lately publiſhed. He had written a book againſt this celebrated reformer, which the pope pretended greatly to admire; and honoured King Henry, on its account, with the title of "Defender of the faith." This character he ſeemed to be determined to maintain, and therefore perſecuted the reformers moſt violently. Many were burnt for denying the popiſh doctrines, and ſome alſo were executed for maintaining the ſupremacy of the pope. The courtiers knew not which ſide to take, as both the new and old religions were equally perſecuted; and as both parties equally courted the favour of the king, he was by that means enabled to aſſume an abſolute authority over the nation. As the monks had all along ſhown the greateſt reſiſtance to Henry's eccleſiaſtical character, he reſolved at once to deprive them of the power of injuring him. He accordingly empowered Cromwell, ſecretary of ſtate, to ſend commiſſioners into the ſeveral counties of England to inſpect the monaſteries; and to report, with rigorous exactneſs, the conduct and deportment of ſuch as were found there. This employment was readily undertaken by ſome creatures of the court, whoſe names were Layton, London, Price, Gage, Petre, and Belaſis. They are ſaid to have diſcovered monſtrous diſorders in many of the religious houſes; whole convents of women abandoned to all manner of lewdneſs; friars accomplices in their crimes; pious frauds every where committed, to increaſe the devotion and liberality of the people; and cruel and inveterate factions maintained between the inhabitants. Thus a general horror was excited againſt theſe communities; and therefore the king, in 1536, ſuppreſſed the leſſer monaſteries, amounting to 376 in number. Their revenues, computed at 32,000 pounds a-year, were confiſcated to the king's uſe; beſides their plate and other goods, computed at 100,000 pounds more. In 1538, the greater monaſteries alſo were demoliſhed. The better to reconcile the people to this great innovation, ſtories were publiſhed, perhaps with aggravations, of the deteſtable lives which the friars led in their convents. The reliques alſo, and other objects of ſuperſtitious veneration, were now brought forth, and became objects of deriſion to the reformers. A great number of theſe are enumerated by Proteſtant writers; ſuch as the parings of St Edmund's toes; ſome of the coals that roaſted St Laurence; the girdle of the Virgin Mary, ſhown in no fewer than eleven different places; two or three heads of St Urſula; the felt of St Thomas of Lancaſter, an infallible cure for the headach; part of St Thomas of Canterbury's ſhirt, much

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Suppreſſion
of the monaſteries.

much reverenced among big-bellied women; ſome reliques, an excellent preſervative againſt rain, others againſt weeds in corn; &c. Some impoſtures, however, were diſcovered, which diſplayed a little more ingenuity in the contrivance. At Hales in the county of Glouceſter had been ſhown, during ſeveral ages, the blood of Chriſt brought from Jeruſalem. The veneration for this precious relique may eaſily be imagined; but it was attended with a moſt remarkable circumſtance not obſerved in any other reliques. The ſacred blood was not viſible to any one in mortal ſin, even when ſet before him; nor could it be diſcovered till he had performed good works ſufficient for his abſolution. At the diſſolution of the monaſtery, the whole contrivance was diſcovered. Two of the monks who were let into the ſecret, had taken the blood of a duck, which they renewed every week: they put it into a phial, one ſide of which was thin and tranſparent cryſtal, the other thick and opaque. When any rich pilgrim arrived, they were ſure to ſhow him the dark ſide, till maſſes and offerings had expiated his offences; after which they made him happy, by turning the phial.—A miraculous crucifix had been kept at Boxely in Kent, and bore the appellation of the *rood of grace*. The lips, eyes, and head of the image, moved on the approach of its votaries. Helſey biſhop of Rocheſter broke the crucifix at St Paul's croſs, and ſhowed to all the people the ſprings and wheels by which it had been ſecretly moved. A great wooden idol, called *Darvel Gatherin*, was alſo brought to London and cut in pieces: and, by a cruel refinement of vengeance, it was employed as fuel to burn Friar Foreſt; who was puniſhed for denying the king's ſupremacy, and for ſome pretended hereſies. A finger of St Andrew, covered with a thin plate of ſilver, had been pawned for a debt of 40 pounds; but as the king's commiſſioners refuſed to releaſe the pawn, people made themſelves very merry with the poor creditor on account of his ſecurity. On this occaſion alſo was demoliſhed the noted ſhrine of Thomas a Becket, commonly called *St Thomas of Canterbury* *. The riches of it were inconceivable when broken down; the gold with which it was adorned filled two large cheſts that eight ſtrong men could ſcarce carry out of the church. The king, on the whole, ſuppreſſed 645 monaſteries, of which 28 had abbots who enjoyed a ſeat in parliament. Ninety colleges were demoliſhed in ſeveral counties; 2374 chantries and free chapels, and 110 hoſpitals. The whole revenue of theſe eſtabliſhments amounted to 161,100 pounds.

It is eaſy to imagine the indignation which ſuch an uninterrupted courſe of ſacrilege and violence would occaſion at Rome. In 1535, the king had executed Biſhop Fiſher, who was created a cardinal while in priſon, and Sir Thomas More, for denying or ſpeaking ambiguouſly about his ſupremacy. When this was reported in Italy, numerous libels were publiſhed all over the country, comparing the king of England to Nero, Domitian, Caligula, and the moſt wicked tyrants of antiquity. Clement VII. died about ſix months after he had threatened the king with a ſentence of excommunication; and Paul III. who ſucceeded him in the Papal throne, entertained ſome hopes of an accommodation. But Henry was ſo much accuſtomed to domineering, that the quarrel was ſoon rendered totally incurable. The execution of Fiſher was reckoned ſuch a capital injury, that at laſt the pope paſſed all his cenſures againſt the king, citing him and all his adherents to appear in Rome within 90 days, in order to anſwer for their crimes. If they failed, he excommunicated them; deprived the king of his realm; ſubjected the kingdom to an interdict; declared his iſſue by Anne Boleyn illegitimate; diſſolved all leagues which any Catholic princes had made with him; gave his kingdom to any invader; commanded the nobility to take up arms againſt him; freed his ſubjects from all oaths of allegiance; cut off their commerce with foreign ſtates; and declared it lawful for any one to ſeize them, to make ſlaves of their perſons, and to convert their effects to his own uſe. But though theſe cenſures were then paſſed, they were not openly denounced. The pope delayed the publication till he ſhould find an agreement with England totally deſperate, and till the emperor, who was then hard preſſed by the Turks and the Proteſtant princes of Germany, ſhould be in a condition to carry the ſentence into execution. But in 1538, when news arrived at Rome that Henry had proceeded with the monaſteries as above related, the pope was at laſt provoked to publiſh the cenſures againſt him. Libels were again diſperſed, in which he was anew compared to the moſt furious perſecutors of antiquity, and the preference was now given on their ſide. Henry, it was ſaid, had declared war with the dead, whom the Pagans themſelves reſpected; was at open enmity with heaven; and had engaged in profeſſed hoſtility with all the ſaints and angels. Above all, he was reproached with his reſemblance to the emperor Julian, whom (it was ſaid) he imitated in his apoſtacy and learning, though he fell ſhort of him in his morals. But theſe terrible fulminations had now loſt their effect. Henry had long ago denied the ſupremacy of the Pope, and therefore had appealed from him to a general council; but now, when a general council was ſummoned at Mantua, he refuſed to be ſubject to it, becauſe it was called by the pope, and lay entirely under ſubjection to that ſpiritual uſurper. He engaged his clergy to make a declaration to the like purpoſe, and preſcribed to them many other alterations with regard to their ancient tenets and practices. It was expected that the ſpirit of oppoſition to the church of Rome would have at laſt made him fall in with the doctrines of the reformed; but though he had been gradually changing the theological ſyſtem in which he was educated, ever ſince he came to the years of maturity, he was equally poſitive and dogmatical in the few articles he retained, as tho' the whole fabric had continued entire and unſhaken: and though he ſtood alone in his opinion, the flattery of courtiers had ſo much inflamed his tyrannical arrogance, that he thought himſelf intitled to regulate by his own particular ſtandard, the religious faith of the whole nation. The point on which he chiefly reſted his orthodoxy was the moſt abſurd in the whole Popiſh doctrine, namely, that of tranſubſtantiation. All departure from this he held to be a damnable error; and nothing, he thought, could be more honourable for him, than, while he broke off all connections with the Roman pontiff, to maintain, in this eſſential article, the purity of the Catholic faith.

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In 1539, a parliament was called, which met on the 28th day of April. The chancellor opened this

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* See *Becket*.

parliament by informing the Houſe of Lords, that it was his majeſty's earneſt deſire to extirpate from his kingdom all diverſity of opinions with regard to religion; and as this enterpriſe was, he owned, difficult and important, he deſired them to chooſe a committee from among themſelves, who might frame certain articles, and communicate them afterwards to parliament. The lords named the vicar-general Cromwell, now created a peer, the archbiſhops of Canterbury and York, the biſhops of Durham, Carliſle, Worceſter, Bath and Wells, Bangor and Ely. This ſmall committee itſelf was agitated with ſuch diverſity of opinions, that it could come to no concluſion. The Duke of Norfolk then moved, that ſince there was no hope of having a report from the committee, the articles of faith propoſed to be eſtabliſhed ſhould be reduced to ſix, and a new committee be appointed to frame an act with regard to them. As this peer was underſtood to ſpeak the king's mind, his motion was immediately complied with; and after a ſhort prorogation, the bill of the ſix articles, or the *bloody bill*, as the Proteſtants juſtly termed it, was introduced; and having paſſed the two houſes, received the king's aſſent. By this law the doctrine of the real preſence was eſtabliſhed; the communion in one kind; the perpetual obligation of vows of chaſtity; the utility of private maſſes; the celibacy of the clergy; and the neceſſity of auricular confeſſion. The denial of the real preſence ſubjected the perſon to death by fire, and to the ſame forfeiture as in caſes of treaſon; and admitted not the privilege of abjuring: an unheard-of cruelty, unknown even to the inquiſition itſelf. The denial of any of the other articles, even though recanted, was puniſhable by the forfeiture of goods and chattels, and impriſonment during the king's pleaſure: an obſtinate adherence to error, or a relapſe, was adjudged to be felony, and puniſhable by death. The marriage of prieſts was ſubjected to the ſame puniſhment. Their commerce with women, was, for the firſt offence, forfeiture and impriſonment; and for the ſecond, death. Abſtaining from confeſſion, and from receiving the euchariſt at the accuſtomed times, ſubjected the perſon to fine, and to impriſonment during the king's pleaſure; and if the criminal perſevered after conviction, he was puniſhable by death and forfeiture, as in caſes of felony. Commiſſioners were to be appointed by the king for inquiring into theſe hereſies and irregular practices, and the criminals were to be tried by a jury.

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The parliament having thus ſurrendered their eccleſiaſtical privileges, next proceeded to ſurrender their civil ones alſo. They gave to the king's proclamations the ſame force as to ſtatutes enacted by parliament, and thus by one blow made a total ſubverſion of the Engliſh conſtitution; and to render the matter worſe, if poſſible, they framed this law as if it were only declaratory, and intended to explain the natural extent of the royal authority.— Notwithſtanding this, however, they afterwards pretended to make ſome limitations in the regal power; and they enacted, that no proclamation ſhould deprive any perſon of his lawful poſſeſſions, liberties, inheritances, &c. nor yet infringe any common law or laudable cuſtom of the realm.

As ſoon as the act of the ſix articles had paſſed, the Catholics were extremely vigilant to inform againſt offenders; and, in a ſhort time, no fewer than 500 perſons were thrown into priſon. But ſome of the chief officers of ſtate remonſtrating againſt the cruelty of puniſhing ſuch a number of delinquents, they were all of them ſet at liberty; and ſoon after this, Henry, as if he had reſolved to give each party the advantage by turns, granted every one permiſſion to have a tranſlation of the Bible, which had been newly made, in his family.

In 1540, the king again complained to parliament of the great diverſity of religious tenets which prevailed among his ſubjects; a grievance, he affirmed, which ought the leſs to be endured, becauſe the ſcriptures were now publiſhed in England, and ought univerſally to be the ſtandard of belief to mankind. But he had appointed, he ſaid, ſome biſhops and divines to draw up a liſt of tenets; and he was determined that Chriſt and the truth ſhould have the victory; whence he ſeems to have expected more from this new book of his doctors, than had enſued from the publication of the ſcriptures. Cromwell, as vicar-general, alſo made a ſpeech in the upper houſe; and the peers in return told him, that he deſerved to be vicar-general to the univerſe: To ſuch a degree of mean and ſervile ſubmiſſion was the Engliſh parliament at this time reduced.

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Suppreſſion of the knights of Malta,

This year alſo the king ſuppreſſed the only religious order remaining in England; namely, the knights of St John of Jeruſalem, or the *knights of Malta*, as they are commonly called. This order had by their valour done great ſervice to Chriſtendom; and had very much retarded, at Jeruſalem, Rhodes, and Malta, the rapid progreſs of the barbarians. During the general ſurrender of the religious houſes in England, they had obſtinately refuſed to give up their revenues to the king; and Henry, who would endure no ſociety that profeſſed obedience to the pope, was obliged to have recourſe to parliament for the diſſolution of this order. Their revenues were large, and formed a conſiderable addition to the acquiſitions which the king had already made. But he had been ſuch a bad economiſt, that, notwithſtanding the immenſe plunder afforded him by the church, he now demanded from parliament a very conſiderable ſupply. The commons, however, though laviſh of the blood of their fellow-ſubjects, were extremely frugal of their money; and it was not without murmuring that the grant could be obtained, even by this abſolute and dreaded monarch.

The king all this time continued to puniſh with unrelenting ſeverity the Proteſtants who offended againſt the law of the ſix articles, and the Papiſts who denied his ſupremacy; which gave occaſion to a foreigner at that time to ſay, that thoſe who were againſt the Pope were burned, and thoſe who were for him were hanged. The king even ſeemed to diſplay in an oſtentatious manner his tyrannical juſtice and impartiality which reduced both parties to ſubjection. This year he executed three Proteſtants and three Papiſts coupled together. The latter declared, that the moſt grievous part of their puniſhment was the being coupled to ſuch heretical miſcreants as ſuffered with them.

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And of many colleges, hoſpitals, &c.

In 542, Henry proceeded to the further diſſolution of colleges, hoſpitals, and other foundations of that nature. The courtiers had been dealing with the preſidents and governors to make a ſurrender of their

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Extreme abſurdity of the king's conduct.

revenues to the king; and they had ſucceeded with eight. But there was an obſtacle to their farther progreſs: it had been provided by the local ſtatutes of moſt of theſe foundations, that no preſident nor any fellows could make ſuch a deed without the unanimous conſent of all the fellows. This conſent would not have been eaſily obtained; but the parliament proceeded in a ſummary manner to annul all theſe ſtatutes; by which means the revenues of thoſe houſes were expoſed to the rapacity of the king and his favourites. Henry alſo now extorted from many biſhops a ſurrender of their chapter-lands; by which means he pillaged the ſees of Canterbury, York, and London, and enriched his favourites with their ſpoils. He engaged the parliament to mitigate the penalties of the ſix articles, as far as regarded the marriage of prieſts, which was now only ſubjected to a forfeiture of goods, chattels, and lands during life: he was ſtill equally bent on maintaining a rigid purity in ſpeculative principles. He had appointed a commiſſion conſiſting of two archbiſhops and ſeveral biſhops of both provinces, together with a conſiderable number of doctors of divinity; and by virtue of his eccleſiaſtical ſupremacy he had charged them to chooſe a religion for his people. Before the commiſſioners, however, had made any progreſs in this arduous undertaking, the parliament had paſſed a law by which they ratified all the tenets which theſe divines ſhould eſtabliſh with the king's conſent; and thus they were not aſhamed of declaring expreſly that they took their religion upon truſt, and had no other rule either in religious or temporal concerns than the arbitrary will of their maſter. One clauſe of the ſtatute, however, ſeems to favour ſomewhat of the ſpirit of liberty. It was enacted, that the eccleſiaſtical commiſſioners ſhould eſtabliſh nothing repugnant to the laws and ſtatutes of the realm. But in reality this proviſo was inſerted by the king, to ſerve his own purpoſes. By introducing a confuſion and contradiction into the laws, he became more the maſter of every one's life and property; and as the ancient independence of the church ſtill gave him jealouſy, he was well pleaſed, under colour of ſuch a clauſe, to introduce appeals from ſpiritual to civil courts. For the ſame reaſon he would never promulgate a body of canon law; and he encouraged the judges on all occaſions to interpoſe in eccleſiaſtical cauſes, wherever they thought the law or the prerogative concerned. Being thus armed by the authority of parliament, or rather by their acknowledgment of his ſpiritual ſupremacy, the king employed his commiſſioners to ſelect a ſyſtem of tenets for the aſſent and belief of the nation. A ſmall volume was publiſhed, under the title of *The Inſtitution of a Chriſtian Man*, which was received by the convocation, and made the infallible ſtandard of orthodoxy. In this book the points of juſtification, faith, free-will, good works, and grace, were diſcuſſed in a manner ſomewhat favourable to the opinions of the reformers. The ſacraments, which a few years before were only allowed to be three, were now increaſed to ſeven, conformably to the ſentiments of the Catholics. Throughout the whole of this book the king's caprice is very diſcernible; and the book is in reality to be regarded as his compoſition. For Henry, while he made his opinion a rule for the nation, would himſelf ſubmit to no authority whatever; not even to any which he had formerly eſtabliſhed. The ſame year the people had a farther inſtance of the king's inconſiſtency. He ordered a new book to be compoſed, called the *Erudition of a Chriſtian Man*; and without aſking the conſent of the convocation, he publiſhed by his own authority this new model of orthodoxy. He was no leſs poſitive in his new creed than he had been in the old one; but though he required the faith of the nation to veer about at his ſignal, he was particularly careful to inculcate the doctrine of paſſive obedience in all his books, and he was no leſs careful to retain the nation in the practice.

But while the king was thus ſpreading his own books among the people, both he and the clergy ſeem to have been very much perplexed with regard to the ſcriptures. A review had been made by the eccleſiaſtical ſynod of the new tranſlation of the Bible; and Biſhop Gardiner had propoſed, that inſtead of employing Engliſh expreſſions throughout, ſeveral Latin words ſhould ſtill be preſerved, becauſe they contained, as he pretended, ſuch peculiar energy and ſignificance, that they had no correſpondent terms in the Engliſh tongue. Among theſe were *eccleſia*, *pœnitentia*, *pontifex*, *contritus*, &c. But as this mixture would appear extremely barbarous, and was plainly calculated for no other purpoſe than to retain the people in their ancient ignorance, the propoſal was rejected. The knowledge of the people, however, ſeemed to be ſtill more dangerous than their ignorance; and the king and parliament, ſoon after the publication of the ſcriptures, retracted the conceſſion which they had formerly made, and prohibited all but gentlemen and merchants to peruſe them. Even that liberty was not granted without an apparent heſitation, and dread of the conſequences. Theſe perſons were allowed to read, *ſo it be done quietly and with good order*. And the preamble to the act ſets forth, "That many ſeditious and ignorant perſons had abuſed the liberty granted them of reading the Bible; and that great diverſity of opinion, animoſities, tumults, and ſchiſms, had been occaſioned by perverting the ſenſe of the ſcriptures." The maſs-book alſo paſſed under the king's examination; but little alteration was yet made in it. Some doubtful or fictitious ſaints only were ſtruck out; and the name of the pope was eraſed. The latter precaution was alſo uſed with every new book that was printed, and even every old one that was ſold. The word *pope* was carefully omitted or blotted out; as if that precaution could aboliſh the term from the language, or cauſe the people forget that ſuch a perſon exiſted. About this time alſo, the king prohibited the acting of plays, interludes, and farces, in deriſion of the Popiſh ſuperſtitions; which the Proteſtants had been in uſe to practiſe: and this prohibition was in the higheſt degree pleaſing to the Roman Catholics.

In this tyrannical and head ſtrong manner Henry proceeded with regard to eccleſiaſtical affairs. In other reſpects his conduct was equally violent. With regard to his domeſtic concerns, hiſtory ſcarce affords his parallel. We have already taken notice of his extreme love for Anne Boleyn, whom he married, contrary even to his own principles, before the marriage with Catharine was diſſolved. His affection for the former was carried to ſuch an height, that he even procured an act excluding from the ſucceſſion the iſſue of Queen Catharine, in favour of the children of

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Anne Boleyn; and failing them to the king's heirs for ever. An oath to this purpoſe was likewiſe enjoined, under penalty of impriſonment during the king's pleaſure, and forfeiture of goods and chattels. All ſlander againſt the king and his new queen or their iſſue, was ſubjected to the penalty of treaſon or miſpriſion of treaſon. The reaſon given for this extreme ſeverity toward his own child was, that her mother had obſtinately refuſed to quit the kingdom, notwithſtanding all the methods he could take to induce her to do ſo. The oath was generally taken throughout the kingdom; Sir Thomas More the chancellor, and Fiſher biſhop of Rocheſter, being the only perſons who refuſed; for which both of them were impriſoned, and ſoon after executed. The unfortunate queen Catharine died, in her retreat at Amphthill, in the year 1536. On her death-bed ſhe wrote a moſt pathetic letter to the king, in which ſhe forgave him all the injuries ſhe had received, and recommended to him in the ſtrongeſt terms their daughter the princeſs Mary. This letter affected Henry ſo much, that he could not read it without tears; but the new queen is ſaid to have exulted in ſuch a manner on hearing of the death of her rival, as was quite inconſiſtent with either decency or humanity. Her triumph, however, was of ſhort duration. Henry had no ſooner poſſeſſed her, ſecure from every diſquieting thought by the death of queen Catharine, than his paſſion began to decline; and to this her delivery of a dead ſon did not a little contribute; for ſo impetuous and abſurd were his paſſions, and ſuch was his deſire for male iſſue, that the diſappointment in this reſpect alone was ſufficient to alienate his affection from his wife. The levity of her temper, and her extreme gaiety of behaviour bordering upon licentiouſneſs, as related under the article Boleyn, alſo gave an opportunity to her enemies of enflaming the king's jealouſy againſt her. The viſcounteſs of Rocheford, in particular, a woman of profligate manners, and who was married to the queen's brother, had the cruelty to report to the king that her huſband committed inceſt with his own ſiſter; and, not content with this, ſhe interpreted every inſtance of favour ſhown by her to a man, as proof of a criminal intercourſe between them. At the ſame time it muſt not be forgot, that he who inſiſted on ſuch rigid fidelity from his wives, was himſelf the moſt faithleſs of mankind. He had doubts, it may be allowed, about the legality of his marriage with Queen Catharine, but his doubts were evidently confirmed by the charms of Anne Boleyn. After being ſatiated with the poſſeſſion of her for ſix years, perhaps he really doubted her fidelity; but here again his doubts were confirmed by the beauty of Jane Seymour, with whom he had now fallen in love. It may eaſily be believed, that from this conſideration alone there was no reaſon to hope that ever the unfortunate Anne would be able to exculpate herſelf. Had ſhe really been guilty, her monſter of a huſband might have allowed her to live; but his cruelty was as unbounded and inſatiable as his other perverſe paſſions. She was condemned; and the ſentence pronounced againſt her was, that ſhe ſhould be burned or beheaded at the king's pleaſure. On hearing this dreadful denunciation, ſhe exclaimed, "O Father! O Creator! thou who art the way, the truth, and the life! thou knoweſt that I have not deſerved this fate." She then made the moſt ſolemn proteſtations of innocence before her judges; but theſe, as they had been from the beginning ineffectual, ſo it was not to be ſuppoſed that they could now avail any thing. Anne was beheaded by the executioner of Calais, who was reckoned more expert than any in England; and Henry enjoyed the pleaſure of marrying his beloved Jane Seymour. His ſatisfaction, however, was of no long continuance: for the queen, becoming pregnant immediately after marriage, died in two days after the birth of the child; who being a ſon, was baptiſed by the name of Edward VI. As this lady had been more beloved by Henry than any of his other wives, his grief for the loſs of her was extreme. However, it did not hinder him from entering very ſoon afterwards into a new matrimonial ſcheme; in which he met with many difficulties. His firſt propoſals were made to the ducheſs dowager of Milan, niece to the emperor and to Catharine his own former queen; but as he had behaved ſo indifferently to the aunt, it is ſcarce to be ſuppoſed that his addreſſes could prove agreeable to the niece. On this he demanded the ducheſs-dowager of Longueville, daughter of the duke of Guiſe; but on making the propoſal to the French monarch, Francis I. he was informed that the princeſs had been already betrothed to the king of Scotland. Henry, however, would take no refuſal. He had learned that the object of his affection was endowed with many accompliſhments, was very beautiful, and of a large ſize, which laſt property he looked upon to be neceſſary for him who was now become ſomewhat corpulent himſelf. Francis, to prevent any more ſolicitations on this ſubject, ſent the princeſs to Scotland, but at the ſame time made Henry an offer of Mary of Bourbon, daughter of the Duke of Vendoſme. This princeſs was rejected by Henry, becauſe he had heard of her being formerly refuſed by the king of Scotland. He was then offered his choice of the two younger ſiſters of the queen of Scotland, both of them being equal in merit as well as ſize to the one whom he had deſired: but Henry, unwilling to truſt to any reports concerning the beauty of theſe ladies, or even to their pictures, propoſed to Francis, that they ſhould have a conference at Calais under pretence of buſineſs, and that the latter ſhould bring with him the two princeſſes of Guiſe with the fineſt ladies of quality in France, that he might make a choice. This indelicate propoſal ſhocked Francis: he returned for anſwer, that he was too much impreſſed with regard for the fair-ſex to carry ladies of the firſt quality, like geldings, to a market, to be choſen or rejected according to the humour of the purchaſer. Henry remonſtrated and ſtormed as uſual; but though Francis at this time earneſtly wiſhed to oblige him, he at laſt totally rejected the propoſal. Negociations were then entered into for a German match; and the princeſs of Cleves was propoſed by Cromwell, on account of the great intereſt her father had with the Proteſtant princes of Germany. Henry had alſo become enamoured of her perſon from a picture of her he had ſeen: but this, tho' drawn by an eminent artiſt, was unluckily done ſo much to the advantage, that when the negociation was quite finiſhed, and the bride arrived in England, he loſt all patience, ſwearing that ſhe was a great Flanders mare, and that he could never bear her the ſmalleſt affection. The matter was ſtill worſe, when he found that ſhe could

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Execution of Anne Boleyn, and third marriage of Henry.

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Queen Jane dies in child-bed of Edward VI.

283
Extravagant behaviour of the king concerning his fourth marriage.

284
Marriage with Anne of Cleves.

could ſpeak no language but Dutch, of which he was entirely ignorant. Notwithſtanding all theſe objections, however, he reſolved to complete the marriage, telling Cromwell, that ſince he had gone ſo far, he muſt now put his neck into the yoke. The reaſon of this was, that the friendſhip of the German princes was now more than ever neceſſary for Henry; and it was ſuppoſed that the affront of ſending the princeſs back to her own country might be reſented. Cromwell, who knew that his own life depended on the event of the matter, was very anxious to learn from the king how he liked his ſpouſe after having paſſed a night with her; but was ſtruck with terror when he replied that he now hated her more than ever; that he was reſolved not to cohabit with her, and even ſuſpected that ſhe was not a virgin; a matter in which he pretended to be a *connoiſſeur*, and about which he was extremely ſcrupulous. In a little time his averſion increaſed to ſuch a degree, that he determined at any rate to get rid of his queen and prime miniſter both at once. Cromwell had long been an object of averſion to the nobility, who hated him on account of his obſcure birth; his father being no other than a blackſmith, though the ſon had obtained the firſt employments in the kingdom. By his office of vicar-general, he had an almoſt abſolute authority over the clergy; he was alſo lord privy-ſeal, lord-chamberlain, and maſter of the wards. He had alſo been inveſted with the order of the garter, and was created earl of Eſſex. This was ſufficient to raiſe the envy of the courtiers: but he had alſo the misfortune to fall under the diſpleaſure of both Proteſtants and Papiſts; the former hating him on account of his concurrence with Henry in their perſecution, and the latter looking upon him as the greateſt enemy of their religion. To theſe unfortunate circumſtances on the part of Cromwell, was added the uſual ſituation of Henry himſelf, who had now fallen in love with Catharine Howard, niece to the Duke of Norfolk; to enjoy whom, he now determined to divorce Anne of Cleves. By the inſinuations of this lady and her uncle, Cromwell's ruin was accompliſhed; and he was condemned, not only without any trial, but even without examination. The charge was of hereſy and high treaſon; but the inſtances of the latter were quite abſurd and ridiculous. He ſubmitted, however, to his ſentence without murmuring, as knowing that his complaints on this ſubject would be revenged on his ſon. He was terribly mangled by the executioner before his head could be ſtruck off. His death was ſoon followed by the diſſolution of the marriage with the princeſs of Cleves, which was annulled by the conſent of both parties. The princeſs parted from him with great indifference; and accepted of L. 3000 a-year as a compenſation, but refuſed to return to her own country after the affront ſhe had received.

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The marriage annulled and Cromwell put to death.

286
Henry falls in love with Catherine Howard.

287
Infidelity and death of the new queen.

The king's marriage with Catharine Howard ſoon followed the diſſolution of that with Anne of Cleves; but the event may ſurely be regarded as a providential puniſhment upon this tyrant, whoſe cruelty, luſt, and other bad qualities, can ſcarcely be matched in hiſtory. We have already mentioned his inſinuations againſt the virtue of the unfortunate princeſs of Cleves, were amply repaid by the actual infidelities of his new queen, whom we muſt ſuppoſe he believed to be a pure and perfect virgin at the time he married her. So happy indeed did he imagine himſelf in this new marriage, that he publicly returned thanks for his conjugal felicity, when a moſt unfortunate information concerning the queen's incontinence was given to Cranmer by one of the name of Laſcelles, whoſe ſiſter had been ſervant to the ducheſs-dowager of Norfolk. He not only gave intelligence of her amours before marriage, but affirmed that ſhe had continued the ſame criminal practices ever ſince. Two of her paramours were arreſted, and confeſſed their crimes: the queen herſelf alſo confeſſed guilt before marriage, but denied having ever been falſe to the king's bed; which, however, had very little probability. She was beheaded on Tower-hill, along with the viſcounteſs of Rochford, who had been a confident in her amours. The latter, as has already been obſerved, was a principal inſtrument in procuring the deſtruction of the unhappy Anne Boleyn, and therefore died unpitied; while the virtuous character of that unfortunate lady received an additional confirmation from the diſcovery of this woman's guilt.

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To ſecure himſelf from any farther diſaſters of this kind, Henry paſſed a moſt extraordinary law, enacting that any one who ſhould know, or ſtrongly ſuſpect any guilt in the queen, might, within 20 days, diſcloſe it to the king or council, without incurring the penalty of any former law againſt defaming the queen; though at the ſame time every one was prohibited from ſpreading the matter abroad, or even privately whiſpering it to others. It was alſo enacted, that if the king married any woman who had been incontinent, taking her for a true maid, ſhe ſhould be guilty of treaſon if ſhe did not previouſly reveal her guilt to him.

These laws afforded diverſion to the people, who now ſaid that the king muſt look out for a widow; as no reputed maid would ever be perſuaded to incur the penalty of the ſtatute. This in truth happened to be the caſe at laſt; for about a year after the death of Catharine Howard, he married, for his ſixth wife, Catharine Parr, widow of Nevil Lord Latimer. This lady, being ſomewhat inclined to the doctrines of the reformation, and having the boldneſs to tell her huſband her mind upon the ſubject, had like to have ſhared the fate of the reſt. The furious monarch, incapable of bearing the leaſt contradiction, inſtantly complained to Biſhop Gardiner, who inflamed the quarrel as much as poſſible; ſo that at laſt the King conſented that articles of impeachment ſhould be drawn up againſt her. But theſe were rendered abortive by the prudence and addreſs of the queen, as related under the article Parr.

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All this time Henry had tyrannized over his nobility in the moſt cruel manner. The old counteſs of Saliſbury, the laſt of the houſe of Plantagenet, was executed with circumſtances of great cruelty. She had been condemned, as uſual, without any trial; and when ſhe was brought to the ſcaffold, refuſed to lay her head on the block in obedience to a ſentence, to the juſtice of which ſhe had never conſented. She told the executioner, therefore, that if he would have her head, he muſt win it the beſt way he could; and thus ſhe ran about the ſcaffold, purſued by the executioner, and.

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tioner, who aimed many fruitleſs blows at her neck before he was able to put an end to her life. Soon after her, the lord Leonard Grey was likewiſe executed for treaſon, but we have very little account of this tranſaction.

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The laſt inſtances of the king's injuſtice and cruelty were the duke of Norfolk and his ſon the earl of Surry. The former had ſerved the king with fidelity, and the latter was a young man of the moſt promiſing hopes. His qualifications, however, were no ſecurity againſt the violence of Henry's temper. He had dropped ſome expreſſions of reſentment againſt the king's miniſters, who had diſplaced him from the government of Boulogne; and the whole family had become obnoxious on account of the late Queen Catharine Howard. From theſe motives, orders were given to arreſt both the father and ſon; and accordingly they were arreſted both on the ſame day, and confined to the Tower. The ducheſs-dowager of Richmond, Surry's own ſiſter, was among the number of his accuſers; and Sir Richard Southwell alſo, his moſt intimate friend, charged him with infidelity to the king. Surry denied the charge, and challenged his accuſer to a ſingle combat. This favour was denied him; and, notwithſtanding his eloquent and ſpirited defence, he was condemned and executed at Tower-hill.—The duke of Norfolk vainly endeavoured to mollify the king by letters and ſubmiſſions. An attainder was found againſt him though the only crime his accuſers could allege was, that he had once ſaid that the king was ſickly, and could not hold out long; and that the kingdom was likely to be torn between the contending parties of different perſuaſions. Cranmer, though engaged for many years in an oppoſite party to that of Norfolk, and though he had received many and great injuries from him, would have no hand in ſuch an unjuſt proſecution; but retired to his ſeat at Croydon. The death-warrant, however, was made out, and immediately ſent to the lieutenant of the Tower; but a period was put to the cruelties and violence of the king by his death, which happened on the 14th of January 1547, the night before Norfolk was to have been executed.

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Henry was ſucceeded by his only ſon Edward, a boy of nine years of age. The moſt remarkable tranſactions of his reign are thoſe with regard to religion. The reſtraint which Henry VIII. had laid upon the Proteſtants was now taken off; and they not only maintained their doctrines openly, but ſoon became the prevailing party. Henry had fixed the majority of his ſon at 18 years of age; and, in the mean time, appointed 16 executors of his will, to whom, during the minority, he entruſted the government of the king and kingdom. This will, he imagined, would be obeyed as implicitly after his death as though he had been alive. But the firſt act of the executors was to chooſe the earl of Hertford, afterwards duke of Somerſet, protector of the realm; and in him was lodged all the regal power, together with a privilege of naming whom he pleaſed for his privy council.

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The duke of Somerſet had long been reckoned a ſecret partiſan of the reformers; and, immediately on his elevation to his preſent high dignity, began to expreſs his intention of reforming the abuſes of the ancient religion. Under his direction and that of Cranmer, therefore, the reformation was carried forward and completed. The only perſon of conſequence who oppoſed the reformers was Gardiner biſhop of Wincheſter; and, to the diſgrace of their own principles, the reformers now ſhowed that they could perſecute as ſeverely as the Papiſts had formerly perſecuted them. Gardiner was committed to the Fleet priſon, where he was treated with great ſeverity. He was afterwards ſent to the Tower; and having continued there two years, he was commanded to ſubſcribe ſeveral articles, among which was one confeſſing the juſtice of his own impriſonment. To all the articles but this he agreed to ſubſcribe; but that did not give ſatisfaction. He was then committed to cloſe cuſtody; his books and papers were ſeized; all company was denied him, and he was not even permitted the uſe of pen and ink. The biſhops of Chicheſter, Worceſter, and Exeter, were in like manner deprived of their offices; but the biſhops of Landaff, Saliſbury, and Coventry, eſcaped by ſacrificing the moſt conſiderable ſhare of their revenues. The libraries of Weſtminſter and Oxford were ordered to be ranſacked, and purged of the Romiſh legends, miſſals, and other ſuperſtitious volumes; in which ſearch, great devaſtation was made even in uſeful literature. Many volumes claſped in ſilver were deſtroyed for the ſake of their rich bindings; many of geometry and aſtronomy were ſuppoſed to be magical, and deſtroyed on that account; while the members of the univerſity, unable to put a ſtop to theſe ravages, trembled for their own ſafety.

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The reformers perſecute the catholics.

The reformers, however, were not contented with ſeverities of this kind. A commiſſion was granted to the primate and others, to ſearch after all Anabaptiſts, heretics, or contemners of the new liturgy. Among the numbers who were found guilty upon this occaſion, was one Joan Boucher, commonly called *Joan of Kent*; who was ſo very obſtinate, that the commiſſioners could make no impreſſion upon her. She maintained an abſtruſe metaphyſical ſentiment, that Chriſt, as man, was a ſinful man; but, as the Word, he was free from ſin, and could be ſubject to none of the frailties of the fleſh with which he was clothed. For maintaining this doctrine, the poor woman was condemned to be burnt to death as an heretic. The young king, who it ſeems had more ſenſe than his teachers, refuſed at firſt to ſign the death-warrant: but at laſt, being overcome by the importunities of Cranmer, he reluctantly complied; declaring, that if he did wrong, the ſin ſhould be on the head of thoſe who had perſuaded him to it. The primate, after making another unſucceſsful effort to reclaim the woman from her opinions, committed her to the flames. Some time after, one Van Paris, a Dutchman, was condemned to death for Arianiſm. He ſuffered with ſo much ſatisfaction, that he hugged and careſſed the faggots that were conſuming him.

The reſt of this reign affords only the hiſtory of intrigues and cabals of the courtiers one againſt another. The protector was firſt oppoſed by his own brother admiral Sir Thomas Seymour, who had married Catharine Parr the late king's widow. She died ſoon after the marriage; and he then made his addreſſes to the princeſs Elizabeth, who is ſaid not to have been averſe to the match. His brother the duke, who was at that time in the north, being informed of

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295 Lady Jane Gray declared heir to the crown.

his ambitious projects, ſpeedily returned, had him attainted of high treaſon, and at laſt condemned and executed. The duke of Somerſet himſelf, however, was ſome time afterwards deprived of his office by Dudley duke of Northumberland; who at laſt found means to get him accuſed of high treaſon, and executed. Not ſatisfied with the office of protector, which he aſſumed on the death of Somerſet, this ambitious nobleman formed a ſcheme of engroſſing the ſovereign power altogether. He repreſented to Edward, who was now in a declining ſtate of health, that his ſiſters Mary and Elizabeth, who were appointed by Henry's will to ſucceed, in failure of direct heirs, to the crown, had both been declared illegitimate by parliament; that the queen of Scots his aunt, ſtood excluded by the king's will; and, being an alien alſo, loſt all right of ſucceeding. The three princeſſes being thus excluded, the ſucceſſion naturally devolved to the marchioneſs of Dorſet eldeſt daughter of the French queen, Henry's ſiſter, who had married the earl of Suffolk after her firſt huſband's death. The next heir to the marchioneſs was Lady Jane Gray, a lady univerſally reſpected, both on account of the charms of her perſon, and the virtues and endowments of her mind. The king, who was accuſtomed to ſubmit to the politic views of this miniſter, agreed to have the ſucceſſion ſubmitted to council, where Northumberland hoped to procure an eaſy concurrence. The judges, however, who were appointed to draw up the king's letters patent for this purpoſe, warmly objected to the meaſure; and gave their reaſons before the council. They begged that a parliament might be ſummoned, both to give it force, and to free its partiſans from danger: they ſaid that the form was invalid, and would not only ſubject the judges who drew it, but every counſellor who ſigned it, to the pains of treaſon. Northumberland could not brook their demurs; he threatened them with his authority, called one of them a *traitor*, and ſaid he would fight with any man in his ſhirt in ſuch a juſt cauſe as that of Lady Jane's ſucceſſion. A method was therefore found out of ſcreening the judges from danger, by granting them the king's pardon for what they ſhould draw up; and at length the patent for changing the ſucceſſion was completed, the princeſſes Mary and Elizabeth were ſet aſide, and the crown ſettled on the heirs of the ducheſs of Suffolk (for ſhe herſelf was contented to forego her claim.)

296 Death of Edward VI.

For ſome time the king had languiſhed in a conſumption. After this ſettlement of the crown, his health viſibly declined every day, and little hopes were entertained of his recovery. To make matters worſe, his phyſicians were diſmiſſed by Northumberland's advice, and by an order of council; and he was put into the hands of an ignorant old woman, who undertook in a little time to reſtore him to health. After the uſe of her medicines all his bad ſymptoms increaſed to the moſt violent degree. He felt a difficulty of ſpeech and breathing; his pulſe failed, his legs ſwelled, his colour became livid, and many other ſigns of approaching death made their appearance. He expired at Greenwich on the 6th of July 1553, in the 16th year of his age and 7th of his reign.

After the death of King Edward, very little regard was paid to the new patent by which Lady Jane Gray had been declared heir to the throne. The undoubted title of Mary, notwithſtanding the ſcandalous behaviour of her father and his ſervile parliaments, was acknowleged by the whole nation. Northumberland, however, was reſolved to put the late king's will in execution. He therefore carefully concealed the death of Edward, in hopes of ſecuring the perſon of Mary, who by an order of council had been required to attend her brother during his illneſs; but ſhe being informed of his death, immediately prepared to aſſert her right to the crown. Northumberland then, accompanied by the duke of Suffolk, the earl of Pembroke, and ſome other noblemen, ſaluted Lady Jane Gray queen of England. Jane was in a great meaſure ignorant of theſe tranſactions, and it was with the utmoſt difficulty ſhe was perſuaded to accept of the dignity conferred upon her. At laſt ſhe complied, and ſuffered herſelf to be conveyed to the Tower, where it was then uſual for the ſovereigns of England to paſs ſome days after their acceſſion. Mary, however, who had retired to Kenning-hall in Norfolk, in a very few days found herſelf at the head of 40,000 men; and Lady Jane reſigned the ſovereignty in ten days, with much more pleaſure than ſhe had received it. She retired with her mother to their own habitation; and Northumberland finding his affairs quite deſperate, attempted to quit the kingdom. But he was ſtopped by the band of penſioner guards, who informed him that he muſt ſtay to juſtify their conduct in taking arms againſt their lawful ſovereign. He therefore ſurrendered himſelf to Mary; and was ſoon after executed, together with Sir John Gates and Sir Thomas Palmer, two infamous tools of his power. Sentence was alſo pronounced againſt Lady Jane Gray and her huſband Lord Guildford; but without any intention of putting it in execution againſt them at preſent, as their youth and innocence pleaded ſo ſtrongly in their favour, neither of them having yet reached their 17th year.

Mary now entered London, and was peaceably ſettled on the throne without any effuſion of blood. The Engliſh, however, ſoon found reaſon to repent their attachment to her cauſe. Though ſhe had at firſt ſolemnly promiſed to defend the religion and laws of her predeceſſor, ſhe no ſooner ſaw herſelf firmly eſtabliſhed on the throne, than ſhe reſolved to reſtore the Popiſh religion, and give back their former power to the clergy. Gardiner, Bonnar, and the other biſhops who had been impriſoned or ſuffered loſs during the laſt reign, were taken from priſon, reinſtated in their ſees, and now triumphed in their turn. On pretence of diſcouraging controverſy, the queen by her prerogative ſilenced all preachers throughout England, except ſuch as ſhould obtain a particular licenſe, and this ſhe was reſolved to give only to thoſe of her own perſuaſion. The greater part of the foreign Proteſtants took the firſt opportunity of leaving the kingdom; and many of the arts and manufactures, which they had ſucceſsfully introduced, fled with them. Soon after, the queen called a parliament, which ſeemed willing to concur in all her meaſures. They at once repealed all the ſtatutes with regard to religion that had paſſed during the reign of Edward VI. and the national religion was again placed on the ſame footing in which it had been at the death of Henry VIII.

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the queen more power to eſtabliſh the religion to which ſhe was ſo much attached, a proper match was to be ſought for her; and it was ſuppoſed that three had already been propoſed as candidates for her favour. Her affection ſeemed to be engaged by the earl of Devonſhire; but as he was rather attached to the Princeſs Elizabeth, he received the overtures which were made him from the queen with neglect. The next perſon mentioned as a proper match for her was Cardinal Pole, a man greatly reſpected for his virtues; but as he was now in the decline of life, Mary ſoon dropped all thoughts of that alliance. At laſt ſhe caſt her eye on Philip II. of Spain, ſon to the Emperor Charles V. He was then in the 27th year of his age, and conſequently agreeable in that reſpect to Mary, who was in her 48th year; but when her intentions with regard to this match became known, the greateſt alarm took place throughout the whole nation. The commons preſented ſuch a ſtrong remonſtrance againſt a foreign alliance, that the queen thought proper to diſſolve the parliament in order to get quit of their importunity. To obviate, however, all clamour, the articles of marriage were drawn up as favourably as poſſible for the intereſts of England. It was agreed, that though Philip ſhould have the title of king, the adminiſtration ſhould be entirely in the queen; that no foreigner ſhould be capable of holding any office in the kingdom; nor ſhould any innovation be made in the laws, cuſtoms, and privileges of the people; that Philip ſhould not carry the queen abroad without her conſent, or any of her children without the conſent of the nobility. Sixty thouſand pounds a-year were to be ſettled upon her as a jointure; and the male iſſue of this marriage were to inherit Burgundy and the Low Countries as well as the crown of England: and in caſe of the death of Don Carlos, Philip's ſon by his former marriage, without any heir, the queen's iſſue ſhould inherit all the reſt of the Spaniſh dominions alſo.

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All theſe conceſſions, however, were not ſufficient to quiet the apprehenſions of the people: they were conſidered merely as words of courſe, which might be retracted at pleaſure; and the whole nation murmured loudly againſt a tranſaction ſo dangerous to its ancient liberty and independence. An inſurrection was raiſed by Sir Thomas Wyatt, a Roman Catholic, at the head of 4000 men, who ſet out from Kent to London, publiſhing a declaration againſt the Spaniſh match and the queen's evil counſellors. Having advanced as far as Southwark, he required that the queen ſhould put the Tower of London into his hands; that ſhe ſhould deliver four counſellors as hoſtages; and, in order to enſure the liberty of the nation, ſhould marry an Engliſhman. But his force was at preſent by far too ſmall to ſupport ſuch magnificent pretenſions; and he unluckily waſted ſo much time without attempting any thing of importance, that the popular ferment entirely ſubſided, his followers abandoned him gradually, and he was at laſt obliged to ſurrender himſelf to Sir Maurice Berkeley near Temple-bar. His followers were treated with great cruelty, no fewer than 400 of them ſuffering by the hand of the executioner; 400 more were conducted with ropes about their necks into the queen's preſence, and there received their pardon. Wyatt himſelf was condemned and executed.

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Princeſs Elizabeth harſhly treated.

This rebellion had almoſt proved fatal to the Princeſs Elizabeth, who for ſome time paſt had been treated with great ſeverity by her ſiſter. Mary, who poſſeſſed a moſt malignant and cruel heart, had never forgot the quarrel between their mothers; and when a declaration was made after her own acceſſion, recogniſing Queen Catharine's marriage as legal, ſhe was thus furniſhed with a pretence for accounting Elizabeth illegitimate. She was likewiſe obnoxious on account of her religion, which Elizabeth at firſt had not prudence ſufficient to conceal; though afterwards ſhe learned full well to diſguiſe her ſentiments. But above all, her ſtanding ſo high in the affection of the Earl of Devonſhire, was a crime not to be forgiven; and Mary made her ſenſible of her diſpleaſure by numberleſs mortifications. She was ordered to take place at court after the Ducheſs of Suffolk and the Counteſs of Lenox; to avoid which, and other indignities, Elizabeth at laſt retired from court altogether into the country. After the ſuppreſſion of Wyatt's rebellion ſhe was committed to the Tower, and underwent a ſtrict examination before the council; but as Wyatt had made a declaration on the ſcaffold that ſhe was in no manner of way concerned, the queen found herſelf under a neceſſity of releaſing her. To get rid of ſuch a troubleſome rival, however, ſhe was offered in marriage to the Duke of Savoy; and on Elizabeth's declining the propoſal, ſhe was committed cloſe priſoner to Woodſtoke. The rebellion proved fatal, however, to many perſons of diſtinction, and gave the queen an opportunity of manifeſting that unbounded cruelty which reigned in her heart. The Tower, and all the priſons in the kingdom, were filled with nobility and gentry, who became objects of royal vengeance, more on account of their credit and intereſt with the people than any concern they were ſuppoſed to have had with Wyatt. Sir Nicholas Throgmorton was tried in Guildhall; but as no ſatisfactory evidence appeared againſt him, the jury gave a verdict in his favour. The queen was ſo much enraged at this diſappointment, that ſhe recommitted him to the Tower, ſummoned the jury before the council, and at laſt ſent them all to priſon, fining them afterwards ſome of 1000 l. and others of 2000 l. each. Sir John Throgmorton, brother to Sir Nicholas juſt mentioned, was condemned and executed upon evidence which had been already rejected as inſufficient. But of all thoſe who periſhed on this occaſion, none excited more univerſal compaſſion than the unfortunate Lady Jane Grey and her huſband Lord Guilford Dudley. They had already received ſentence of death, as has been mentioned; and two days after the execution of Wyatt, they received orders to prepare for eternity. Lady Jane, who had been in expectation of this blow, was no way intimidated, but received the news with the moſt heroic reſolution. The place intended at firſt for their execution was Tower-hill; but the council, dreading the effects of the people's compaſſion for their youth, beauty, and innocence, gave directions that they ſhould be beheaded within the verge of the Tower. The duke of Suffolk was ſoon after tried, condemned, and executed; but would have met with more compaſſion, had not his am-

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Execution of Lady Jane Grey and her huſband.

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The people
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ambition been the cauſe of his daughter's unhappy fate juſt mentioned. Sir Thomas Gray alſo loſt his life on the ſame account: but the cruel ſpirit of Mary was ſtill unſatisfied; and finding herſelf univerſally odious, that ſhe might free herſelf from any apprehenſions for what was paſt, as well as tyrannize with the more freedom in time to come, ſhe diſabled the people from reſiſtance, by ordering general muſters, and cauſing the commiſſioners ſeize their arms and lay them up in forts and caſtles.

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Marriage
with Philip
ſolemnized.

Notwithſtanding this unpopularity, however, the rebellion of Wyatt had ſo ſtrengthened the hands of government, that a parliament was aſſembled in hopes of gratifying the queen's wiſhes in regard to her marriage with Philip of Spain. To facilitate this purpoſe alſo, the emperor of Germany ſent over to England 400,000 crowns to be diſtributed among the members of parliament in bribes and penſions; a practice of which there had hitherto been no example in England. The queen, notwithſtanding her bigotry, reſumed the title of *Supreme Head of the Church*, which ſhe had dropped three months before. Gardiner made a ſpeech, in which he propoſed, that they ſhould inveſt the queen with a legal power of diſpoſing of the crown, and appointing her ſucceſſor; but the parliament, however obſequious in other reſpects, did not chooſe to gratify their ſovereign in a meaſure by which the kingdom of England might become a province of the Spaniſh monarchy. They would not even declare it treaſon to imagine or attempt the death of the queen's huſband during her life-time, though they agreed to ratify the articles of marriage. Finding therefore that the parliament even yet was not ſufficiently obſequious, it was thought moſt proper to diſſolve them. Soon after this the marriage with Philip was ſolemnized; but as the latter had eſpouſed his queen merely with a view to become king of England, he no ſooner found himſelf diſappointed in this than he ſhowed a total want of affection for her as a wife. He paſſed moſt of his time at a diſtance from her in the Low Countries; and ſeldom wrote to her except when he wanted money, with which Mary would at all times gladly have ſupplied him even had it been at the expence of her kingdom, if in her power.

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Proteſtants
perſecuted.

The enemies of the ſtate being ſuppoſed to be ſuppreſſed, thoſe of the Catholic religion were next perſecuted. The old ſanguinary laws which had been rejected by a former parliament were now revived. Orders were given, that the prieſts and biſhops who had married ſhould be ejected; that the maſs ſhould be reſtored, and the pope's authority eſtabliſhed; and that the church and its privileges, all but their goods and eſtates, ſhould be put on the ſame footing on which they were before the commencement of the reformation. But as the gentry and nobility had already divided the church-lands among them, it was thought inconvenient, and indeed impoſſible, to make a reſtoration of theſe. The perſons who chiefly promoted theſe meaſures were Gardiner biſhop of Wincheſter, and Cardinal Pole, who was a kinſman of Henry VIII. but had been long in Italy, and was now returned from it. The latter was for tolerating the Proteſtants; but the former, perceiving that rigorous meaſures would be moſt agreeable to the king and queen, declared himſelf againſt it. He was too prudent, however, to appear in perſon at the head of the perſecution; and therefore conſigned that office to Bonner biſhop of London, a man of a very abandoned character. The bloody ſcene began by the execution of Hooper biſhop of Gloceſter, and Rogers prebendary of St Paul's. Theſe were quickly followed by others, of whom the principal were Archbiſhop Cranmer, Ridley biſhop of London, and Latimer biſhop of Worceſter*. Theſe perſecutions ſoon became odious to the whole nation, and the perpetrators of them were all willing to throw the blame from themſelves upon others. Philip endeavoured to faſten the whole reproach upon Bonnar; but that biſhop would not take the whole, and therefore retorted on the court. A bold ſtep was now taken to introduce a court ſimilar to the Spaniſh inquiſition, that ſhould be empowered to try heretics, and condemn them without any other law but its own authority. But even this was thought a method too dilatory in the preſent exigence of affairs. A proclamation iſſued againſt books of hereſy, treaſon, and ſedition, declared, that whoſoever had ſuch books in his poſſeſſion, and did not burn them without reading, ſhould ſuffer as a rebel. This was attended with the execution of ſuch numbers, that at laſt the magiſtrates who had been inſtrumental in theſe cruelties refuſed to give their aſſiſtance any longer. It was computed, that during this perſecution, 277 perſons ſuffered by fire, beſides thoſe puniſhed by impriſonments, fines, and confiſcations. Among thoſe who ſuffered by fire were 5 biſhops, 21 clergymen, 8 lay-gentlemen, 84 tradeſmen, 100 huſbandmen, 55 women, and 4 children.

The only remarkable tranſaction which happened during this reign with regard to the temporal affairs of the kingdom was the loſs of Calais, which had been in the poſſeſſion of the Engliſh for upwards of 200 years*. This loſs filled the whole kingdom with complaints, and the queen with grief. She was heard to ſay, that, when dead, the name of *Calais* would be found engraven on her heart. She did not long ſurvive this loſs; but died in the year 1558, of a lingering illneſs, after a reign of five years four months and eleven days.

30
Mary
and i
ceede
Eliza

After the death of Mary, the Princeſs Elizabeth ſucceeded to the throne without oppoſition. She was at Hatfield when news of her ſiſter's death were brought her; upon which ſhe haſtened up to London, where ſhe was received with great joy. This princeſs was well qualified for government. She had judgment ſufficient to make choice of proper miniſters, and authority enough to keep her ſubjects in awe. The reſtraints alſo, to which ſhe had been ſubjected during her ſiſter's reign, had taught her ſo well to conceal her ſentiments, that ſhe had become a perfect miſtreſs of diſſimulation; which, though no commendable part of her character, proved occaſionally of great ſervice to her government. She perfected the reformation, and put the religion of England upon the ſame plan which ſubſiſts at preſent. This was accompliſhed without the leaſt difficulty; for the perſecutions in Mary's reign had ſerved only to give the whole nation an averſion for popery. In the time of Edward VI. the people had been compelled to embrace the Proteſtant religion, and their fears induced them to conform; but now, almoſt the whole nation were Proteſtants from inclination. The reformation was confirmed by act of parliament in 1559, and thus

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* See
mer, &

* See
*Calai.*

thus England was ſeen to change its religion four times in the ſpace of 32 years.

309 ce with nce.

During the time that the queen and her counſellors were employed in ſettling the religious affairs of the nation, negociations were likewiſe carried on for a peace between England and France; which was at laſt concluded on the following terms, viz. that Henry ſhould reſtore Calais at the expiration of eight years; that in caſe of failure, he ſhould pay 500,000 crowns, and Elizabeth's title to Calais ſtill remain; that for the payment of this ſum he ſhould find the ſecurity of eight foreign merchants, not natives of France; and until that ſecurity were provided he ſhould deliver five hoſtages. If during this interval Elizabeth ſhould break the peace with France or Scotland, ſhe ſhould forfeit all title to Calais; but if Henry made war on Elizabeth, he ſhould be obliged to reſtore the fortreſs immediately. This pacification was ſoon followed by an irreconcileable quarrel with Mary queen of Scotland; which was not extinguiſhed but by the death of the Scottiſh princeſs; and that with ſuch circumſtances of accumulated treachery, hypocriſy, and diſſimulation, as have ſtamped an indelible diſgrace on the memory of Elizabeth. See the articles Mary and Scotland.

310 para- for with in.

Elizabeth having at laſt got rid of her rival in the year 1587, began to make preparations for reſiſting the Spaniſh invaſion. Hearing that Philip was ſecretly fitting out a great navy to attack her, ſhe ſent Sir Francis Drake with a fleet to pillage his coaſts and deſtroy his ſhipping. On this expedition he ſet ſail with four capital ſhips furniſhed by the queen, and 26 others of various ſizes furniſhed him by the merchants of London in hopes of ſharing the plunder.

311 loits of Francis ke.

Having learned that a Spaniſh fleet richly laden was lying at Cadiz in readineſs to ſet ſail for Liſbon, he directed his courſe towards the former port, where he boldly attacked the enemy. Six galleys were obliged to take ſhelter under the cannon of the forts; he burned about 100 veſſels laden with ammunition and naval ſtores; and deſtroyed a great ſhip belonging to the Marquis de Santa Croce. Thence ſetting ſail for Cape St Vincent, he took by aſſault the caſtle ſituated on that promontory, with three other fortreſſes. Having next inſulted Liſbon, he ſailed to the Teneras, where after lying in wait for ſome time, he took a rich prize, and then returned to England; having by this ſhort expedition taught the Engliſh to deſpiſe the huge and unwieldy ſhips of the enemy, and thus prepared them to act with more reſolution againſt the formidable armament that now threatened to invade them.

12 arriage hilip's ne of vaſion.

But though the expedition of Sir Francis Drake had retarded the intended invaſion of England for a twelvemonth, it had not by any means induced Philip to abandon his deſign. During that interval he continued his preparations with the greateſt aſſiduity, the more eſpecially as the invaſion of England ſeemed to be a neceſſary preparative for regaining his authority over the Netherlands, the revolted provinces having been ſtrongly ſupported by Elizabeth. The fleet prepared at this time was ſuperior to any thing then exiſting in the world; and no doubt being entertained of its ſucceſs, it was oſtentatiouſly ſtyled the *Invincible Armada*. The miſerable event of this expedition, and the total failure of all the mighty hopes of Philip, are related under the article Armada. The ſpirit and courage of the Engliſh were now excited to attempt invaſions in their turn; which they executed in numerous deſcents on the Spaniſh coaſts; though theſe were only temporary, and deſigned not for permanent conqueſt, but to haraſs the enemy. It would be endleſs to relate all the advantages obtained over the enemy at ſea, where the capture of every ſhip muſt have made a ſeparate narrative. It is ſufficient to obſerve, that the ſea-captains of that reign are ſtill conſidered as the boldeſt and moſt enterpriſing ſet of men that England ever produced; and among this number we are to reckon Raleigh and Howard, Drake, Cavendiſh, and Hawkins. The Engliſh navy then began to take the lead; and has ſince continued irreſiſtible in all parts of the ocean.

Elizabeth continued to reign with great glory till the year 1603; but all her greatneſs could not prevent her from being extremely miſerable before her death. She had cauſed her greateſt favourite, and probably her lover, the earl of Eſſex *, to be executed. Though this execution could not be called unjuſt, the queen's affection (on being informed that he had at laſt thrown himſelf entirely on her clemency) returned to ſuch a degree, that ſhe thenceforth gave herſelf entirely over to deſpair.

313 Grief and miſery of Elizabeth.

She refuſed food and ſuſtenance; ſhe continued ſilent and gloomy; ſighs and groans were the only vent ſhe gave to her deſpondence; and ſhe lay for ten days and nights upon the carpet, leaning on cuſhions, which her maids brought her. Perhaps the faculties of her mind were impaired by long and violent exerciſe; perhaps ſhe reflected with remorſe on ſome paſt actions of her life, or perceived, but too ſtrongly, the decays of nature, and the approach of her diſſolution. She ſaw her courtiers remitting in their aſſiduity to her, in order to pay their court to James the apparent ſucceſſor. Such a concurrence of cauſes was more than ſufficient to deſtroy the remains of her conſtitution; and her end was now viſibly ſeen to approach. Feeling a perpetual heat in her ſtomach, attended with an unquenchable thirſt, ſhe drank without ceaſing, but refuſed the aſſiſtance of her phyſicians. Her diſtemper gaining ground, Cecil and the lord admiral deſired to know her ſentiments with regard to the ſucceſſion. To this ſhe replied, That as the crown of England had always been held by kings, it ought not to devolve upon any inferior character, but upon her immediate heir the king of Scotland. Being then adviſed by the archbiſhop of Canterbury to fix her thoughts upon God, ſhe replied, that her thoughts did not in the leaſt wander from him. Her voice ſoon after left her; ſhe fell into a lethargic ſlumber, which continued ſome hours; and ſhe expired gently without a groan, in the 70th year of her age, and 45th of her reign.

314 Her death.

She was ſucceeded by James I. king of Scotland; ſince which time, the hiſtory of both England and Scotland is comprehended under the article Britain.

315 England, how divided.

Since the Norman conqueſt, England has been divided into ſix circuits, each circuit containing a certain number of counties. Two judges are appointed for each circuit, which they viſit in the ſpring and autumn, for adminiſtering juſtice to the ſubjects who are at a diſtance from the capital. In holding the lent (or ſpring) aſſizes, the northern circuit extends only to York and Lancaſter; the aſſizes at Durham, Newcaſtle, Carliſle, and Appleby, being held only in the autumn,

* See Devereux.

England.

autumn, and diſtinguiſhed by the appellation of the *long circuit*. Theſe circuits and counties are :

1. *Home Circuit* contains the counties of Eſſex, Hertford, Kent, Surry, and Suſſex.

2. *Norfolk Circuit* contains thoſe of Bucks, Bedford, Huntingdon, Cambridge, Suffolk, and Norfolk.

3. *Oxford Circuit.* Oxon, Berks, Glouceſter, Worceſter, Monmouth, Hereford, Salop, and Stafford.

4. *Midland Circuit.* Warwick, Leiceſter, Derby, Nottingham Lincoln, Rutland, and Northampton.

5. *Weſtern Circuit.* Hants, Wilts, Dorſet, Somerſet, Devon, and Cornwal.

6. *Northern Circuit.* York, Durham, Northumberland, Lancaſter, Weſtmoreland, and Cumberland.

Middleſex and Cheſhire are not comprehended in the above circuits ; the former being the ſeat of the ſupreme courts of juſtice, and the latter a county palatine. There is ſtill a court of chancery in Lancaſter and Durham, with a chancellor ; and there is a court of exchequer at Cheſter, of a mixed kind, both for law and equity, of which the chamberlain of Cheſter is judge : there are alſo other juſtices in the counties palatine to determine civil actions and pleas of the crown.

Beſides the 40 counties into which England is divided, there are counties corporate, conſiſting of certain diſtricts, to which the liberties and juriſdictions peculiar to a county have been granted by charter from the throne. Thus the city of London is a county diſtinct from Middleſex ; the cities of York, Cheſter, Briſtol, Norwich, Worceſter, and the towns of Kingſton upon Hull and Newcaſtle upon Tyne, are counties of themſelves, diſtinct from thoſe in which they lie. The ſame may be ſaid of Berwick upon Tweed, which lies in Scotland, and has within its juriſdiction a ſmall territory of two miles on the north ſide of the river. Under the name of a *town*, boroughs and cities are contained : for every borough or city is a town, though every town is not a borough or city.—An account of the Engliſh conſtitution and government is given under the articles KING, LORDS, COMMONS, PARLIAMENT, LAW, LIBERTY, RIGHTS, &c.

316 Religion

The eſtabliſhed religion of England is Epiſcopacy. Since the reign of Henry VIII. the ſovereigns of England have been called, in public writs, the ſupreme heads of the church; but this title conveys no ſpiritual meaning, as it only denotes the regal power to prevent any eccleſiaſtical differences, or, in other words, to ſubſtitute the king in place of the pope before the reformation, with regard to temporalities and the internal economy of the church. The kings of England never intermeddle in eccleſiaſtical diſputes, and are contented to give a ſanction to the legal rights of the clergy.

The church of England, under this deſcription of the monarchical power over it, is governed by two archbiſhops, and 24 biſhops, beſides the biſhop of Sodor and Man, who, not being poſſeſſed of an Engliſh barony, does not ſit in the houſe of peers. See ARCHBISHOP and BISHOP.

England contains about 60 archdeacons. Subordinate to them are the rural deacons, formerly ſtyled *archpreſbyters*, who ſignify the biſhop's pleaſure to his clergy, the lower claſs of which conſiſts of pariſh-prieſts (who are called *rectors* or *vicars*), deacons, and curates. See the articles CURATE, DEACON, PARSON, and VICAR.

31 Reven of the c.ergy

The following is a liſt of the Engliſh biſhoprics, with their revenues, as charged in the king's books: though that ſum is far from being the real annual value of the ſee, yet it aſſiſts in forming a comparative eſtimate between the revenues of each ſee with thoſe of another.

| ARCHBISHOPRICS. | £. | s. | d. |
|---|---|---|---|
| Canterbury, | 2682 | 12 | 2 |
| York, | 1610 | 0 | 0 |
| BISHOPRICS. | | | |
| London, | 2000 | 0 | 0 |
| Durham, | 1821 | 1 | 3 |
| Wincheſter, | 3124 | 12 | 8 |
| Theſe three biſhops take precedency of all others in England, and the others according to the ſeniority of their conſecrations. | | | |
| Ely, | 2134 | 18 | 6 |
| Bath and Wells, | 533 | 1 | 3 |
| Hereford, | 768 | 11 | 0 |
| Rocheſter, | 358 | 4 | 9 |
| Lichfield and Coventry, | 559 | 17 | 3 |
| Cheſter, | 420 | 1 | 8 |
| Worceſter, | 929 | 13 | 3 |
| Chicheſter, | 677 | 1 | 3 |
| St Aſaph, | 187 | 11 | 8 |
| Saliſbury, | 1385 | 5 | 0 |
| Bangor, | 131 | 16 | 3 |
| Norwich, | 834 | 11 | 7 |
| Glouceſter, | 315 | 7 | 3 |
| Landaff, | 154 | 14 | 2 |
| Lincoln, | 894 | 18 | 1 |
| Briſtol, | 294 | 11 | 0 |
| Carliſle, | 531 | 4 | 9 |
| Exeter, | 500 | 0 | 0 |
| Peterborough, | 414 | 14 | 8 |
| Oxford, | 381 | 11 | 0 |
| St Davids, | 426 | 2 | 1 |

The eccleſiaſtical government of England is, properly ſpeaking, lodged in the convocation ; which is a national repreſentative or ſynod, and anſwers pretty near to the ideas we have of a parliament. They are convoked at the ſame time with every parliament; and their buſineſs is to conſider of the ſtate of the church, and to call thoſe to an account who have advanced new opinions, inconſiſtent with the doctrines of the church of England. Some high-flying clergymen during the reign of queen Anne, and in the beginning of that of George I. raiſed the powers of the convocation to a height that was inconſiſtent with the principles of religious toleration, and indeed of civil liberty: ſo that the crown was obliged to exert its prerogative of calling the members together, and of diſſolving them; and ever ſince they have not been permitted to ſit for any time, in which they could do buſineſs.

NEW ENGLAND, late a province of the Britiſh empire in America, is bounded on the north by Canada, on the eaſt by Nova Scotia and the Atlantic ocean, on the ſouth by the Atlantic and Long Iſland Sound, and on the weſt by New York. It lies in the form of a quarter of a circle. Its weſt line, beginning at the mouth of Byram river which empties into Long Iſland Sound at the ſouth-weſt corner of Connecticut, latitude 41°, runs a little eaſt of north, until it ſtrikes the 45th degree of latitude, and then curves to the eaſtward almoſt to the gulph of St Lawrence.

1
en firſt
overed.

This country was diſcovered in the beginning of the laſt century, and called *North Virginia;* but no Europeans ſettled there till the year 1608. The firſt colony, which was weak and ill-directed, did not ſucceed; and, for ſome time, there were only a few adventurers who came over at times in the ſummer, built themſelves temporary huts for the ſake of trading with the ſavages, and, like them, diſappeared again for the reſt of the year. At laſt ſome Browniſts, headed by Mr Robinſon, whom Neal ſtyles the Father of the Independents, who in 1610 had been driven from England by perſecution, fled to Holland, and ſettled at Leyden; but in 1621 determined, with Mr Brewſter aſſiſtant preacher to Mr Robinſon, to found a church for their ſect in the new hemiſphere. They therefore purchaſed, in 1521, the charter of the Engliſh North Virginia company. Forty one families, making in all 120 perſons, landed in the beginning of a very hard winter, and found a country entirely covered with wood, which offered a very melancholy proſpect to men already exhauſted with the fatigues of their voyage. Near one half periſhed either by cold, the ſcurvy, or other diſtreſs. The courage of the reſt was beginning to fail; when it was revived by the arrival of 60 ſavage warriors, who came to them in the ſpring, headed by their chief. The old tenants aſſigned for ever to the new ones all the lands in the neighbourhood of the ſettlement they had formed, under the name of *New Plymouth;* and one of the ſavages who underſtood a little Engliſh, ſtaid to teach them how to cultivate the maize, and inſtruct them in the manner of fiſhing upon their coaſt.

This kindneſs enabled the colony to wait for the companions they expected from Europe with ſeeds, with domeſtic animals, and with every aſſiſtance they wanted. At firſt theſe ſuccours arrived but ſlowly; but the perſecution of the Puritans in England increaſed the number of proſelytes to ſuch a degree in America, that in 1630 they were obliged to form different ſettlements, of which Boſton ſoon became the principal. Theſe firſt ſettlers were not merely eccleſiaſtics, who had been deprived of their preferments on account of their opinions; nor thoſe ſectaries influenced by new opinions, that are ſo frequent among the common people. There were among them ſeveral perſons of high rank, who, having embraced Puritaniſm, had taken the precaution to ſecure themſelves an aſylum in theſe diſtant regions. They had cauſed houſes to be built, and lands to be cleared, with a view of retiring there, if their endeavours in the cauſe of civil and religious liberty ſhould prove abortive.

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can
nents.

The inhabitants of New England lived peaceably for a long time, without any regular form of policy. Their charter had indeed authorized them to eſtabliſh any mode of government they might chooſe; but theſe enthuſiaſts were not agreed among themſelves upon the plan of their republic and government did not pay ſufficient attention to them to urge them to ſecure their own tranquillity. At length they grew ſenſible of the neceſſity of a regular legiſlation; and this great work, which virtue and genius united have never attempted but with diffidence, was boldly undertaken by blind fanaticiſm. It bore the ſtamp of the rude prejudices on which it had been formed. There was in this new code a ſingular mixture of good and evil, of wiſdom and folly. No man was allowed to have a ſhare in the government except he were a member of the eſtabliſhed church. Witchcraft, perjury, blaſphemy, and adultery, were made capital offences; and children were alſo puniſhed with death, either for curſing or ſtriking their parents. Marriages, however, were to be ſolemnized by the magiſtrate. The price of corn was fixed at 2 s. 11$\frac{1}{2}$ d. per buſhel. The ſavages who neglected to cultivate their lands were to be deprived of them; and Europeans were forbidden under a heavy penalty to ſell them any ſtrong liquors or warlike ſtores. All thoſe who were detected either in lying, drunkenneſs, or dancing, were ordered to be publicly whipped. But at the ſame time that amuſements were ſorbidden equally with vices and crimes, one might be allowed to ſwear by paying a penalty of 11$\frac{3}{4}$d. and to break the ſabbath for 2 l. 19 s. 9$\frac{3}{4}$d. Another indulgence allowed was, to atone, by a fine, for a neglect of prayer, or for uttering a raſh oath. But it is ſtill more extraordinary, that the worſhip of images were forbidden to the Puritans on pain of death; which was alſo inflicted on Roman Catholic prieſts, who ſhould return to the colony after they had been baniſhed; and on Quakers who ſhould appear again after having been whipped, branded, and expelled. Such was the abhorrence for theſe ſectaries, who had themſelves an averſion for every kind of cruelty, that whoever either brought one of them into the country, or harboured him but for one hour, was liable to pay a conſiderable fine.

New
England.

2
Firſt code
of laws.

Quakers
perſecuted.

Thoſe unfortunate members of the colony, who, leſs violent than their brethren, ventured to deny the coercive power of the magiſtrate in matters of religion, were perſecuted with ſtill greater rigour. This was conſidered as blaſphemy by thoſe very divines who had rather choſen to quit their country than to ſhow any deference to Epiſcopal authority. This ſyſtem was ſupported by the ſeverities of the law, which attempted to put a ſtop to every difference in opinion, by inflicting capital puniſhment on all who diſſented. Thoſe who were either convicted, or even ſuſpected, of entertaining ſentiments of toleration, were expoſed to ſuch cruel oppreſſions, that they were forced to fly from their firſt aſylum, and ſeek refuge in another. They found one on the ſame continent; and as New England had been firſt founded by perſecution, its limits were extended by it.

This intemperate religious zeal extended itſelf to matters in themſelves of the greateſt indifference. A proof of this is found in the following public declaration, tranſcribed from the regiſters of the colony.

4
Law againſt
wearing
long hair.

"It is a circumſtance univerſally acknowledged, "that the cuſtom of wearing long hair, after the "manner of immoral perſons and of the ſavage In-"dians, can have been introduced into England only "in ſacrilegious contempt of the expreſs command of "God, who declares that it is a ſhameful practice for "any man who has the leaſt care for his ſoul to wear "long hair. As this abomination excites the indig-"nation of all pious perſons; we, the magiſtrates, in "our zeal for the purity of the faith, do expreſsly "and authentically declare, that we condemn the im-

"pious

“ pious cuſtom of letting the hair grow ; a cuſtom which we look upon to be very indecent and diſhoneſt, which horribly diſguiſes men, and is offenſive to modeſt and ſober perſons, in as much as it corrupts good manners. We therefore, being juſtly incenſed againſt this ſcandalous cuſtom, do deſire, adviſe, and earneſtly requeſt all the elders of our continent, zealouſly to ſhow their averſion for this odious practice, to exert all their power to put a ſtop to it, and eſpecially to take care that the members of their churches be not infected with it; in order that thoſe perſons who, notwithſtanding theſe rigorous prohibitions, and the means of correction that ſhall be uſed on this account, ſhall ſtill perſiſt in this cuſtom, ſhall have both God and man at the ſame time againſt them.”

This ſeverity ſoon exerted itſelf againſt the Quakers. They were whipped, baniſhed, and impriſoned. The behaviour of theſe new enthuſiaſts, who in the midſt of tortures and ignominy praiſed God, and called for bleſſings upon men, inſpired a reverence for their perſons and opinions, and gained them a number of proſelytes. This circumſtance exaſperated their perſecutors, and hurried them on to the moſt atrocious acts of violence ; and they cauſed five of them, who had returned clandeſtinely from baniſhment, to be hanged. This ſpirit of perſecution was, however, at laſt ſuppreſſed by the interpoſition of the mother-country, from whence it had been brought. Charles II. moved with the ſufferings of the Quakers, put a ſtop to them by a proclamation in 1661 ; but he was never able totally to extinguiſh the ſpirit of perſecution that prevailed in America.

The colony had placed at their head Henry Vane, the ſon of that Sir Henry Vane who had ſuch a remarkable ſhare in the diſturbances of his country. This obſtinate and enthuſiaſtic young man had contrived to revive the queſtions of grace and free-will. The diſputes upon theſe points ran very high ; and would probably have plunged the colony into a civil war, if ſeveral of the ſavage nations united had not happened at that very time to fall upon the plantations of the diſputants, and to maſſacre great numbers of them. The coloniſts, heated with their theological conteſts, paid at firſt very little attention to this conſiderable loſs. But the danger at length became ſo urgent and ſo general, that all took up arms. As ſoon as the enemy was repulſed, the colony reſumed its former diſſentions ; and the phrenzy which they excited broke out in 1692 in a war, marked with as many atrocious inſtances of violence as any ever recorded in hiſtory.

5
Extraordinary perſecution of witches.

There lived in a town of New England, called *Salem*, two young women who were ſubject to convulſions, accompanied with extraordinary ſymptons. Their father, miniſter of the church, thought that they were bewitched ; and having in conſequence caſt his ſuſpicions upon an Indian girl who lived in his houſe, he compelled her by harſh treatment to confeſs that ſhe was a witch. Other women, upon hearing this, immediately believed, that the convulſions, which proceeded only from the nature of their ſex, were owing to the ſame cauſe. Three citizens, caſually named, were immediately thrown into priſon, accuſed of witchcraft, hanged, and their bodies left expoſed to wild beaſts and birds of prey. A few days after, 16 other perſons, together with a counſellor, who, becauſe he refuſed to plead againſt them, was ſuppoſed to ſhare in their guilt, ſuffered in the ſame manner. From this inſtant, the imagination of the multitude was inflamed with theſe horrid and gloomy ſcenes. Children of ten years of age were put to death, young girls were ſtripped naked, and the marks of witchcraft ſearched for upon their bodies with the moſt indecent curioſity; and thoſe ſpots of the ſcurvy which age impreſſes upon the bodies of old men, were taken for evident ſigns of the infernal power. In default of theſe, torments were employed to extort confeſſions dictated by the executioners themſelves. If the magiſtrates, tired out with executions, refuſed to puniſh, they were themſelves accuſed of the crimes they tolerated ; the very miniſters of religion raiſed falſe witneſſes againſt them, who made them forfeit with their lives the tardy remorſe excited in them by humanity. Dreams, apparitions, terror, and conſternation of every kind, increaſed theſe prodigies of folly and horror. The priſons were filled, the gibbets left ſtanding, and all the citizens involved in gloomy apprehenſions. The moſt prudent quitted the country ſtained with the blood of its inhabitants ; and nothing leſs than the total and immediate ſubverſion of the colony was expected, when, on a ſudden, all eyes were opened at once, and the exceſs of the evil awakened the minds which it had firſt ſtupified. Bitter and painful remorſe was the immediate conſequence; the mercy of God was implored by a general faſt, and public prayers were offered up to aſk forgiveneſs for the preſumption of having ſuppoſed that heaven could have been pleaſed with ſacrifices with which it could only have been offended.

Poſterity will, probably, never know exactly what was the cauſe or remedy of this dreadful diſorder. It had, perhaps, its firſt origin in the melancholy which thoſe perſecuted enthuſiaſts had brought with them from their own country, which had increaſed with the ſcurvy they had contracted at ſea, and had gathered freſh ſtrength from the inconveniences and hardſhips inſeparable from a change of climate and manner of living. The contagion, however, ceaſed like all other epidemical diſtempers, exhauſted by its very communication. A perfect calm ſucceeded this agitation ; and the Puritans of New England have never ſince been ſeized with ſo gloomy a fit of enthuſiaſm.

But though the colony has renounced the perſecuting ſpirit which hath ſtained all religious ſects with blood, it has preſerved ſome remains, if not of intoleration, at leaſt of ſeverity, which remind us of thoſe melancholy days in which it took its riſe. Some of its laws are ſtill too ſevere.

New England had, however, ſome remedy againſt bad laws, in the conſtitution of its mother-country, where the people who have the legiſlative power in their own hands are at liberty to correct abuſes; and it has others derived from its ſituation, which open a vaſt field to induſtry and population.

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The clearing of the lands in this colony is not directed by chance as in the other provinces. This matter from the firſt was ſubjected to laws which are ſtill religiouſly obſerved. No citizen whatever has the liberty of ſettling even upon unoccupied land. The government, deſirous of preſerving all its members from the inroads of the ſavages, and of placing them in a condition to ſhare in the protection of a well-regulated ſociety, hath ordered that whole villages ſhould be formed at once. As ſoon as 60 families offer to build a church, maintain a clergyman, and pay a ſchoolmaſter, the general aſſembly allot them a ſituation, and permit them to have two repreſentatives in the legiſlative body of the colony. The diſtrict aſſigned them always borders upon the lands already cleared, and generally contains 60,000 ſquare acres. Theſe new people chooſe the ſituation moſt convenient for their habitation, which is uſually of a ſquare figure. The church is placed in the centre; the coloniſts divide the land among themſelves, and each incloſes his property with a hedge. Some woods are reſerved for a common; and thus New England is conſtantly enlarging its territory, though it ſtill continues to make one complete and well conſtituted province.

7 iſion, The country was divided into four ſtates, which at firſt had no connection with one another. The neceſſity of maintaining an armed force againſt the ſavages, obliged them to form a confederacy in 1643, when they took the name of the *United Colonies*. In conſequence of this league, two deputies from each eſtabliſhment uſed to meet in a ſtated place to deliberate upon the common affairs of New England, according to the inſtructions they had received from the aſſembly by which they were ſent. This aſſociation laid no conſtraint upon the right of every individual to act entirely as he pleaſed, without either the permiſſion or approbation of the mother-country. All the ſubmiſſion required of theſe provinces was merely to acknowledge the kings of England for their ſovereigns. Charles II. wiſhed to make them more dependent. The province of Maſſachuſet's bay, which, though the ſmalleſt, was the richeſt and the moſt populous of the four, being guilty of ſome miſdemeanour againſt government, the king ſeized that opportunity of taking away its charter in 1684: and it remained without one till the revolution; when it received another, which, however, did not anſwer its claims or expectations. The crown reſerved to itſelf the right of nominating the governor, and appointing to all military employments, and to all principal poſts in the civil and juridical departments: it allowed the people of the colony their legiſlative power, and gave the governor a negative voice and the command of the troops, which ſecured him a ſufficient influence to enable him to maintain the prerogative of the mother-country in all its force. The provinces of Connecticut and Rhode-Iſland, by timely ſubmiſſion, prevented the puniſhment which that of Maſſachuſets had incurred, and retained their original charter. That of New-Hampſhire had been always regulated by the ſame mode of adminiſtration as the province of Maſſachuſets bay. The ſame governor preſided over the whole colony, but with regulations adapted to the conſtitution of each province. To the above ſtates, another has been added ſince the late revolution, *viz.* VERMONT. Theſe ſtates are ſubdivided into counties, and the counties into townſhips.

8 of the try, ntains, New England is a high, hilly, and in ſome parts a mountainous country, formed by nature to be inhabited by a hardy race of free, independent republicans.—The mountains are comparatively ſmall, running nearly north and ſouth in ridges parallel to each other. Between theſe ridges flow the great rivers in majeſtic meanders, receiving the innumerable rivulets and larger ſtreams which proceed from the mountains on each ſide. To a ſpectator on the top of a neighbouring mountain, the vales between the ridges, while in a ſtate of nature, exhibit a romantic appearance. They ſeem an ocean of woods, ſwelled and depreſſed in its ſurface like that of the great ocean itſelf. A richer though leſs romantic view is preſented, when the valleys, by induſtrious huſbandmen, have been cleared of their natural growth; and the fruit of their labour appears in loaded orchards, extenſive meadows, covered with large herds of ſheep and neat cattle, and rich fields of flax, corn, and the various kinds of grain. Theſe valleys, which have received the expreſſive name of *interval lands*, are of various breadths, from 2 to 20 miles; and by the annual inundations of the rivers which flow through them, there is frequently an accumulation of rich, fat ſoil, left upon their ſurface when the waters retire.

There are four principal ranges of mountains, paſſing nearly from north-eaſt to ſouth-weſt through New-England. Theſe conſiſt of a multitude of parallel ridges, each having many ſpurs, deviating from the courſe of the general range; which ſpurs are again broken into irregular hilly land. The main ridges terminate, ſometimes in high bluff heads, near the ſea-coaſt, and ſometimes by a gradual deſcent in the interior part of the country. One of the main ranges runs between Connecticut and Hudſon's rivers. This range branches and bounds the vales through which flows the Houſatonick river. The moſt eaſtern ridge of this range terminates in a bluff head at Meriden; a ſecond ends in like manner at Willingford, and a third at New Haven. In Lyme, on the eaſt ſide of Connecticut river, another range of mountains commences, forming the eaſtern boundary of Connecticut vale. This range trends northerly, at the diſtance, generally, of about 10 or 12 miles eaſt from the river, and paſſes through Maſſachuſets, where the range takes the name of *Chickabee Mountain*; thence croſſing into New Hampſhire, at the diſtance of about 20 miles from the Maſſachuſets line, it runs up into a very high peak, called *Monadnick*, which terminates this ridge of the range. A weſtern ridge continues, and in about latitude 43° 20′ runs up into Sunipee mountains. About 50 miles further, in the ſame ridge, is Mooſcoog mountain, A third range begins near Stonington in Connecticut. It takes its courſe north-eaſterly, and is ſometimes broken and diſcontinued; it then riſes again, and ranges in the ſame direction into New Hampſhire, where, in latitude 43° 25′, it runs up into a high peak called *Cowſawaſkog*. The fourth range has a humble beginning about Hopkinton in Maſſachuſets. The eaſtern ridge of this range runs north by Watertown and Concord, and croſſes Merrimack river at Pantucket Falls. In New Hampſhire, it riſes into ſeveral high peaks, of which the White mountains is the principal. From theſe White mountains a range continues north eaſt, croſſing the eaſt boundary of New Hampſhire, in latitude 44° 30′, and forms the height of land between Kennebek and Chaudiere rivers. Theſe ranges of mountains are full of lakes, ponds, and ſprings of water, that give riſe to numberleſs ſtreams of various ſizes, which, interlocking

ing each other in every direction, and falling over the rocks in romantic caſcades, flow meandering into the rivers below. No country on the globe is better watered than New England.

On the ſea-coaſt the land is low, and in many parts level and ſandy. In the valleys, between the forementioned ranges of mountains, the land is generally broken, and in many places rocky, but of a ſtrong rich ſoil, capable of being cultivated to good advantage, which alſo is the caſe with many ſpots even on the tops of the mountains.

The principal river in New England is Connecticut. See CONNECTICUT.

9 Soil, productions, &c.

The ſoil, as may be collected from what has been ſaid, muſt be very various. Each tract of different ſoil is diſtinguiſhed by its peculiar vegetation, and is pronounced good, middling, or bad, from the ſpecies of trees which it produces; and from one ſpecies generally predominating in each ſoil, has originated the deſcriptive names of oak land, birch, beech, and cheſnut lands, pine, barren, maple, aſh, and cedar ſwamps, as each ſpecies happens to predominate. Intermingled with thoſe predominating ſpecies are walnut, firs, elm, hemlock, magnolia, mooſe wood, ſaſſafras, &c. &c. The beſt lands produce walnut and cheſnut; the next, beech and oak; lands of the third quality produce fir and pitch pine; the next, whortleberry and barberry buſhes; and the pooreſt produce nothing but marſhy imperfect ſhrubs. Among the flowering trees and ſhrubs in the foreſts, are the red-flowering maple, the ſaſſafras, the locuſt-tree, the tulip-tree, honeyſuckle, wild roſe, dogwood, elm, leather-tree, laurel, hawthorn, &c. which in the ſpring of the year give the woods a moſt beautiful appearance, and fill them with a delicious fragrance. Among the fruits which grow wild, are the ſeveral kinds of grapes; which are ſmall, ſour, and thick ſkinned. The vines on which they grow are very luxuriant, often overſpreading the higheſt trees in the foreſts; and without doubt, might be greatly meliorated by proper cultivation. Beſides theſe, are the wild cherries, white and red mulberries, cranberries, walnuts, hazelnuts, cheſnuts, butter nuts, beech nuts, wild plums and pears, whortle-berries, bilberries, gooſeberries, ſtrawberries, &c.

The ſoil in the interior country is calculated for the culture of Indian corn, rye, oats, barely, flax, and hemp (for which the ſoil and climate are peculiarly proper), buck-wheat, beans, peas, &c In many of the inland parts wheat is raiſed in large quantities; but on the ſea-coaſt it has never been cultivated with ſucceſs, being ſubject to blaſts. The fruits which the country yields from culture, are, apples in the greateſt plenty; of theſe cyder is made, which conſtitutes the principal drink of the inhabitants; alſo, pears of various ſorts, quinces, peaches (from which is made peach brandy,) plums, cherries, apricots, &c. The culinary plants are ſuch as have already been enumerated. New England is a fine grazing country; the valleys between the hills are generally interſected with brooks of water, the banks of which are lined with a tract of rich meadow or interval land. The high and rocky ground is, in many parts, covered with honeyſuckle, and generally affords the fineſt of paſture. It will not be a matter of wonder, therefore, that New England boaſts of raiſing ſome of the fineſt cattle in the world; nor will ſhe be envied, when the labour of raiſing them is taken into view. Two months of the hotteſt ſeaſon in the year the farmers are employed in procuring food for their cattle; and the cold winter is ſpent in dealing it out to them. The pleaſure and profit of doing this, is however a ſatiſfying compenſation to the honeſt and induſtrious farmer.

10 Populati manners, cuſtoms, and dive ſions,

New England is the moſt populous part of the United States. It contains at leaſt 823,000 ſouls. One fifth of theſe are fencible men. New England then, ſhould any great and ſudden emergency require it, could furniſh an army of 164,600 men. The great body of theſe are land-holders and cultivators of the ſoil. The former attaches them to their country; the latter, by making them ſtrong and healthy, enables them to defend it. The boys are early taught the uſe of arms, and make the beſt of ſoldiers. Few countries on earth, of equal extent and population, can furniſh a more formidable army than this part of the union.

New England may, with propriety, be called a nurſery of men, whence are annually tranſplanted, into other parts of the United States, thouſands of its natives. The State of Vermont, which is but of yeſterday, and contains about 100,000 ſouls, has received more inhabitants from Connecticut than from any other ſtate; and yet between the years 1774 and 1782, notwithſtanding her numerous emigrations to Vermont, Suſquehannah, and other places, and the depopulation occaſioned by a ſeven years bloody war, it is found, from an actual cenſus of the inhabitants in the years before-mentioned, that they have increaſed from 197,856, their number in 1774, to 290,150, their number in 1782. Vaſt numbers of the New Englanders, ſince the war, have emigrated into the northern parts of New York, into Kentucky and the Weſtern Territory, and into Georgia; and ſome are ſcattered into every State, and every town of note in the union.

The New Englanders are generally tall, ſtout, and well built. They glory, and perhaps with juſtice, in poſſeſſing that ſpirit of freedom which induced their anceſtors to leave their native country, and to brave the dangers of the ocean and the hardſhips of ſettling a wilderneſs. Their education, laws, and ſituation, ſerve to inſpire them with high notions of liberty. Their jealouſy is awakened at the firſt notion toward an invaſion of their rights. They are indeed often jealous to exceſs; a circumſtance which is a fruitful ſource of imaginary grievances, and of innumerable groundleſs ſuſpicions and unjuſt complaints againſt government. A law, reſpecting the deſcent of eſtates which are generally held in fee ſimple, which for ſubſtance is the ſame in all the New England ſtates, is the chief foundation and protection of this liberty. By this law, the poſſeſſions of the father are to be equally divided among all the children, excepting the eldeſt ſon, who has a double portion. In this way is preſerved that happy mediocrity among the people, which, by inducing economy and induſtry, removes from them temptations to luxury, and forms them to habits of ſobriety and temperance. At the ſame time, their induſtry and frugality exempt them from want, and from the neceſſity of ſubmitting to any encroachment on their liberties.

In New England, learning is more generally diffuſed among all ranks of people than in almoſt any other part of the globe; ariſing from the excellent eſtabliſhment of ſchools in every townſhip. Another ſource of information to the people is the newſpapers, of which not leſs than 30,000 are printed every week in New England, and circulated in almoſt every town and village in the country. A perſon of mature age, who cannot both read and write, is rarely to be found. By means of this general eſtabliſhment of ſchools, the extenſive circulation of newſpapers, and the conſequent ſpread of learning, every townſhip throughout the country is furniſhed with men capable of conducting the affairs of their town with judgment and diſcretion. Theſe men are the channels of political information to the lower claſs of people; if ſuch a claſs may be ſaid to exiſt in New England, where every man thinks himſelf at leaſt as good as his neighbour, and believes that all mankind are, or ought to be, equal. The people from their childhood form habits of canvaſſing public affairs, and commence politicians. This naturally leads them to be very inquiſitive. This deſire after knowledge, in a greater or leſs degree, prevails throughout all claſſes of people in New England: and from their various modes of expreſſing it, ſome of which are blunt and familiar, bordering on impertinence, ſtrangers have been induced to mention impertinent inquiſitiveneſs as a diſtinguiſhing characteriſtic of New England people.—Each man alſo has his independent ſyſtem of politics; and each aſſumes a dictatorial office. Hence originates that reſtleſs, litigious, complaining ſpirit, which forms a dark ſhade in the character of New Englandmen.

Before the late war, which introduced into New England a flood of corruptions, with many improvements, the Sabbath was obſerved with great ſtrictneſs; no unneceſſary travelling, no ſecular buſineſs, no viſiting, no diverſions were permitted on that ſacred day. They conſidered it as conſecrated to divine worſhip, and were generally punctual and ſerious in their attendance upon it. Their laws were ſtrict in guarding the Sabbath againſt every innovation. The ſuppoſed ſeverity with which theſe laws were compoſed and executed, together with ſome other traits in their religious character, have acquired, for the New Englanders, the name of a ſuperſtitious bigotted people. But ſuperſtition and bigotry are ſo indefinite in their ſignifications, and ſo variouſly applied by perſons of different principles and educations, that it is not eaſy to determine how far they deſerved that character. Leaving every perſon to enjoy his own opinion in regard to this matter, we will only obſerve, that, ſince the war, a catholic tolerant ſpirit, occaſioned by a more enlarged intercourſe with mankind, has greatly increaſed, and is becoming univerſal; and if they do not break the proper bound, and liberalize away all true religion, of which there is much danger, they will counteract that ſtrong propenſity in human nature, which leads men to vibrate from one extreme to its oppoſite.

There is one diſtinguiſhing characteriſtic in the religious character of this people, which we muſt not omit to mention; and that is, the cuſtom of annually celebrating faſts and thankſgivings. In the ſpring, the ſeveral governors iſſue their proclamations, appointing a day to be religiouſly obſerved in faſting, humiliation, and prayer, throughout their reſpective ſtates, in which the predominating vices, that particularly call for humiliation, are enumerated. In autumn, after harveſt, that gladſome era in the huſbandman's life, the governors again iſſue their proclamations appointing a day of public thankſgiving, enumerating the public bleſſings received in the courſe of the foregoing year. This pious cuſtom originated with their venerable anceſtors, the firſt ſettlers of New England; and has been handed down as ſacred through the ſucceſſive generations of their poſterity. A cuſtom ſo rational, and ſo happily calculated to cheriſh in the minds of the people a ſenſe of their dependence on the great Benefactor of the world for all their bleſſings, it is hoped will ever be ſacredly preſerved.

The people of New England generally obtain their eſtates by hard and perſevering labour: They of conſequence know their value, and ſpend with frugality. Yet in no country do the indigent and unfortunate fare better. Their laws oblige every town to provide a competent maintenance for their poor; and the neceſſitous ſtranger is protected and relieved from their humane inſtitutions. It may in truth be ſaid, that in no part of the world are the people happier, better furniſhed with the neceſſaries and conveniences of life, or more independent than the farmers in New England. As the great body of the people are hardy independent freeholders, their manners are, as they ought to be, congenial to their employment, plain, ſimple, and unpoliſhed. Strangers are received and entertained among them with a great deal of artleſs ſincerity and friendly unformal hoſpitality. Their children, thoſe imitative creatures, to whoſe education particular attention is paid, early imbibe the manners and habits of thoſe around them; and the ſtranger, with pleaſure, notices the honeſt and decent reſpect that is paid him by the children as he paſſes through the country.

As the people, by repreſentation, make their own laws and appoint their own officers, they cannot be oppreſſed; and living under governments which have few lucrative places, they have few motives to bribery, corrupt canvaſſings, or intrigue. Real abilities and a moral character unblemiſhed are the qualifications requiſite in the view of moſt people for offices of public truſt. The expreſſion of a wiſh to be promoted is the direct way to be diſappointed.

The inhabitants of New England are generally fond of the arts, and have cultivated them with great ſucceſs. Their colleges have flouriſhed beyond any others in the United States. The illuſtrious characters they have produced, who have diſtinguiſhed themſelves in politics, law, divinity, the mathematics and philoſophy, natural and civil hiſtory, and in the fine arts, particularly in poetry, evince the truth of theſe obſervations.

Many of the women in New England are handſome. They generally have fair, freſh, and healthful countenances, mingled with much female ſoftneſs and delicacy. Thoſe who have had the advantages of a good education (and they are conſiderably numerous), are genteel, eaſy, and agreeable in their manners, and are ſprightly and ſenſible in converſation. They are early taught to manage domeſtic concerns with neatneſs and economy. Ladies of the firſt rank and fortune make it a part of their daily buſineſs to ſuperintend the affairs of the family. Employment at the needle, in cookery, and at the ſpinning-wheel, with them is honourable. Idleneſs, even in thoſe of independent fortunes, New England, Engliſh.

tunes, is univerſally diſreputable. The women in the country manufacture the greateſt part of the clothing of their families. Their linen and woollen cloths are ſtrong and decent. Their butter and cheeſe is not inferior to any in the world.

Dancing is the principal and favourite amuſement in New England; and of this the young people of both ſexes are extremely fond. Gaming is practiſed by none but thoſe who cannot or rather will not find a reputable employment. The gameſter, the horſe-jockey, and the knave, are equally deſpiſed, and their company is avoided by all who would ſuſtain fair and irreproachable characters. The odious and inhuman practices of duelling, gouging, cock-fighting, and horſe-racing, are ſcarcely known here.—The athletic and healthy diverſions of cricket, football, quoits, wreſtling, jumping, foot-races, &c. are univerſally practiſed in the country, and ſome of them in the moſt populous places, and by people of almoſt all ranks. Squirrel-hunting is a noted diverſion in country places, where this kind of game is plenty. Some divert themſelves with fox-hunting, and others with the more profitable ſports of fiſhing and duck-hunting; and in the frontier ſettlements where deer and fur game abound, the inhabitants make a lucrative ſport of hunting them. In the winter ſeaſon, while the ground is covered with ſnow, which is commonly two or three months, ſleighing is the general diverſion. A great part of the families throughout the country are furniſhed with horſes and ſleighs.

11 Trade.

New England has no one ſtaple commodity. The ocean and the foreſts afford the two principal articles of export. Codfiſh, mackarel, ſhad, ſalmon, and other fiſh—whale oil and whale bone—maſts, boards, ſcantling, ſtaves, hoops, and ſhingles, have been and are ſtill exported in large quantities. The annual amount of cod and other fiſh for foreign exportation, including the profits ariſing from the whale-fiſhery, is eſtimated at upwards of half a million.—Beſides the articles enumerated, they export from the various parts of New England ſhips built for ſale, horſes, mules, live ſtock—pickled beef and pork, potaſh, pearl-aſh, flax, ſeed, butter and cheeſe, rum, &c. The balance of trade, as far as imperfect calculations will enable us to judge, has generally been againſt New England; not from any unavoidable neceſſity, but from her extravagant importations. From a view of the annual imports into New England, it appears that the greateſt part of them conſiſts of the luxuries, or at beſt the diſpenſable conveniences of life; the country affords the neceſſaries in great abundance.

ENGLISH, or the *English Tongue*, the language ſpoken by the people of England, and, with ſome variation, by thoſe of Scotland, as well as part of Ireland, and the reſt of the Britiſh dominions.

The ancient language of Britain is generally allowed to have been the ſame with the Gallic, or French; this iſland, in all probability, having been firſt peopled from Gallia, as both Cæſar and Tacitus affirm, and prove by many ſtrong and concluſive arguments, as by their religion, manners, cuſtoms, and the nearneſs of their ſituation. But now we have very ſmall remains of the ancient Britiſh tongue, except in Wales, Cornwall, the iſlands and Highlands of Scotland, part of Ireland, and ſome provinces of France; which will not appear ſtrange, when what follows is conſidered.

Engliſh.

Julius Cæſar, ſome time before the birth of our Saviour, made a deſcent upon Britain, though he may be ſaid rather to have diſcovered than conquered it; but about the year of Chriſt 45, in the time of Claudius, Aulus Plautius was ſent over with ſome Roman forces, by whom two kings of the Britons, Togodumnus and Caractacus, were both overcome in battle: whereupon a Roman colony was planted at Malden in Eſſex, and the ſouthern parts of the iſland were reduced to the form of a Roman province: after that, the iſland was conquered as far north as the friths of Dunbarton and Edinburgh, by Agricola, in the time of Domitian; whereupon a great number of the Britons, in the conquered part of the iſland, retired to the weſt part called *Wales*, carrying their language with them.

The greateſt part of Britain being thus become a Roman province, the Roman legions, who reſided in Britain for above 200 years, undoubtedly diſſeminated the Latin tongue; and the people being afterwards governed by laws written in Latin, muſt neceſſarily make a mixture of languages. This ſeems to have been the firſt mutation the language of Britain ſuffered.

Thus the Britiſh tongue continued, for ſome time, mixed with the provincial Latin, till, the Roman legions being called home, the Scots and Picts took the opportunity to attack and haraſs England: upon which, K. Vortigern, about the year 440, called the Saxons to his aſſiſtance; who came over with ſeveral of their neighbours, and having repulſed the Scots and Picts, were rewarded for their ſervices with the iſle of Thanet and the whole county of Kent; but growing too powerful, and not being contented with their allotment, diſpoſſeſſed the inhabitants of all the country on this ſide of the Severn *: thus the Britiſh tongue was in a great meaſure deſtroyed, and the Saxon introduced in its ſtead.

* See *England*, nº 42.

What the Saxon tongue was long before the conqueſt, about the year 700, we may obſerve in the moſt ancient manuſcript of that language, which is a gloſs on the Evangeliſts, by biſhop Edfrid, in which the three firſt articles of the Lord's prayer run thus:

"Uren fader thic arth in heofnas, ſic gehalgud thin noma, ſo cymeth thin ric. Sic thin willa ſue is heofnas, aud in eortho," &c.

In the beginning of the ninth century the Danes invaded England; and getting a footing in the northern and eaſtern parts of the country, their power gradually increaſed, and they became ſole maſters of it in about 200 years. By this means the ancient Britiſh obtained a tincture of the Daniſh language; but their government being of no long continuance, did not make ſo great an alteration in the Anglo-Saxon as the next revolution, when the whole land, A. D. 1067, was ſubdued by William the conqueror, Duke of Normandy in France: for the Normans, as a monument of their conqueſt, endeavoured to make their language as generally received as their commands, and thereby rendered the Britiſh language an entire medley.

About the year 900, the Lord's prayer, in the ancient Anglo-Saxon, ran thus:

"Thue ur fader the eart on heofenum, ſi thin nama gehalgod;

gehalgod ; cume thin rice ſi thin willa on eorthan ſwa, ſwo on heofenum," &c.

About the year 1160, under Henry II. it was rendered thus by Pope Adrian, an Engliſhman, in rhyme :

" Ure fader in heaven rich,
" Thy name be halyed ever lich,
" Thou bring us thy michel bliſſe:
" Als hit in heaven y doe,
" Evar in yearth been it alſo," &c.

Dr Hicks gives us an extraordinary ſpecimen of the Engliſh, as ſpoken in the year 1385, upon the very ſubject of the Engliſh tongue.

" As it is knowe how meny maner peple beeth in this lond ; ther beeth alſo ſo many dyvers longages and tonges. Notheleſs Walſchemen and Scots that beeth nought medled with other nation, holdeth wel nyh hir firſte longage and ſpeche ; but yif the Scottes, that were ſometime confederate and woned with the Pictes, drawe ſomewhat after hir ſpeche ; but the Flemynges, that woneth on the weſt ſide of Wales, haveth loſt her ſtrange ſpech, and ſpeketh Sexonliche now. Alſo Engliſhemen, they had from the bygynnynge thre maner ſpeche ; northerne, ſoutherne, and middel ſpeche in the middel of the lond, as they come of thre maner of peple of Germania : notheleſs by commyxtion and mellynge firſt with Danes, and afterwards with Normans, in meny the contrary longage is apayred *(corrupted.)*

" This apayrynge of the burth of the tunge is bycauſe of tweie things ; oon is for children in ſcole agenſt the uſuage and maner of all other nations, beeth compelled for to leve hir own longage, and for to conſtrue hir leſſons and here thinges in Frenſche, and ſo they haveth ſethe Normans come firſt into Engelond. Alſo gentlemen children beeth taught to ſpeke Frenſche from the tyme that they beeth roked in here cradel, and kunneth ſpeke and play with a childe's broche ; and uplondiſſche men will lykne hymſelf to gentilmen, and fondeth with great beſyneſſe for to ſpeak Frenſche to be told of.—Hit ſeemeth a greet wonder how Engliſchemen and hir own longage and tonge is ſo dyverſe of ſown in this oon iland : and the longage of Normandie is comlynge of another lond, and hath oon maner ſoun amonge alle men that ſpeketh hit arigt in Engelond. Alſo of the foreſaid Saxon tonge that is deled *(divided)* a three, and is abide ſcarceliche with fewe uplondiſſche men, is greet wonder. For men of the eſt, with men of the weſt, is, as it were, undir the ſame partie of hevene accordeth more in ſownynge of ſpeche, than men of the north with men of the ſouth. Therefore it is that Mercii, that beeth men of myddel Engelond, as it were, parteners of the endes, underſtondeth bettre the ſide longes northerne and ſoutherne, than northerne and ſoutherne underſtondeth either other.—All the longage of the Northumbers and ſpechialliche at York, is ſo ſcharp, ſlitting and frotynge, and unſchape, that we ſoutherne men may that longage unnethe underſtonde," &c.

In the year 1537, the Lord's prayer was printed as follows : " O oure father which arte in heven, hallowed be thy name : let thy kingdome come, thy will be fulfilled as well in erth as it is in heven ; geve us this daye in dayly bred," &c. Where it may be obſerved, that the diction is brought almoſt to the preſent ſtandard, the chief variations being only in the orthography. By theſe inſtances, and many others that might be given, it appears, that the Engliſh Saxon language, of which the Normans deſpoiled us in a great meaſure, had its beauties, was ſignificant and emphatical, and preferable to what they impoſed on us. " Great, verily (ſays Cambden), was the glory of our tongue before the Norman conqueſt, in this, that the old Engliſh could expreſs moſt aptly, all the conceptions of the mind in their own tongue, without borrowing from any." Of this he gives ſeveral examples.

Having thus ſhown how the ancient Britiſh language was in a manner extirpated by the Romans, Danes, and Saxons, and ſucceeded by the Saxon, and after that the Saxon blended with the Norman French, we ſhall now mention two other cauſes of change in the language. The firſt of theſe is owing to the Britons having been a long time a trading nation, whereby offices, dignities, names of wares, and terms of traffic, are introduced, which we take with the wares from the perſons of whom we have them, and form them anew, according to the genius of our own tongue ; and beſides this change in the language, ariſing from commerce, Britain's having been a conſiderable time ſubject to the ſee of Rome, in eccleſiaſtical affairs, muſt unavoidably have introduced ſome Italian words among us. Secondly, As to the particular properties of a language, our tongue has undergone no ſmall mutation, or rather has received no ſmall improvement upon that account : for, as to the Greek and Latin, the learned have, together with the arts and ſciences now rendered familiar among us, introduced abundance ; nay, almoſt all the terms of art in the mathematics, philoſophy, phyſic, and anatomy ; and we have entertained many more from the Latin, French, &c. for the ſake of neatneſs and elegancy ; ſo that, at this day, our language, which, about 1800 years ago, was the ancient Britiſh, or Welſh, &c. is now a mixture of Saxon, Teutonic, Dutch, Daniſh, Norman, and modern French, embelliſhed with the Greek and Latin. Yet this, in the opinion of ſome, is ſo far from being a diſadvantage to the Engliſh tongue as now ſpoken (for all languages have undergone changes, and do continually participate with each other), that it has ſo enriched it, as now to render it the moſt copious, ſignificant, fluent, courteous, and maſculine language in Europe, if not in the world.

**ENGRAFTING**, in gardening. See GRAFTING.

**ENGRAILED**, or INGRAILED, in heraldry, a term derived from the French *greſly*, "hail ;" and ſignifying a thing the hail has fallen upon and broke off the edges, leaving them ragged, or with half rounds, or ſemicircles, ſtruck out of their edges.

**ENGRAVING**, the art of cutting metals and precious ſtones, and repreſenting thereon figures, letters, or whatever device or deſign the artiſt fancies.

Engraving, properly a branch of ſculpture, is divided into ſeveral other branches, according to the matter whereon it is employed, and the manner of performing it. For the rudeſt branch, that of

*ENGRAVING on Wood.* See *CUTTING in Wood.*

*ENGRAVING on Copper*, the making, correſpondently to ſome delineated figure or deſign, ſuch concave lines on a ſmooth ſurface of copper, either by cutting or corroſion, as render it capable, when charged properly with any coloured fluid, of imparting by compreſſion an an exact repreſentation of the figure or deſign to paper or parchment.

Whether we conſider the art of engraving, with regard to the utility and pleaſure it affords, or the difficulty that attends its execution, we cannot but confeſs, that on every account it deſerves a diſtinguiſhed rank among the polite arts †. It is by means of this art that the cabinets of the curious are adorned with the portraits of the greateſt men of all ages and all nations; that their memories, their moſt remarkable and moſt glorious actions, are tranſmitted to the lateſt poſterity. It is by this art alſo, that the paintings of the greateſt maſters are multiplied to a boundleſs number; and that the lovers of the polite arts, diffuſed over the face of the whole earth, are enabled to enjoy thoſe beauties from which their diſtant ſituations ſeemed to have for ever debarred them; and perſons of moderate fortune are hereby enabled to become poſſeſſed of all the ſpirit, and all the poetry, that are contained in thoſe miracles of art, which ſeemed to have been reſerved for the temples of Italy, or the cabinets of princes. When we reflect, moreover, that the engraver, beſide the beauties of poetic compoſition, and the artful ordinance of deſign, is to expreſs, merely by the means of light and ſhade, all the various tints of colours and clair obſcure; to give a relief to each figure, and a truth to each object; that he is now to paint a ſky ſerene and bright, and then loaded with dark clouds; now the pure tranquil ſtream, and then the foaming, raging ſea; that here he is to expreſs the character of the man, ſtrongly marked in his countenance, and there the minuteſt ornament of his dreſs; in a word, that he is to repreſent all even the moſt difficult objects in nature; we cannot ſufficiently admire the vaſt improvements in this art, and that degree of perfection to which it is at this day arrived. See the article PRINTS.

† See *Polite* ARTS, n° 13.

Engraving is an art, for the greateſt part, of modern invention; having its riſe no earlier than the middle of the 15th century. The ancients, it is true, practiſed engraving on precious ſtones and cryſtals with very good ſucceſs; and there are ſtill many of their works remaining equal to any production of the later ages. But the art of engraving on plates and blocks of wood, to afford prints or impreſſions, was not known till after the invention of painting in oil.

The different modes of engraving are the following:

In ſtrokes cut through a thin wax, laid upon the copper, with a point, and theſe ſtrokes bitten or corroded into the copper with aquafortis. This is called *etching*.

In ſtrokes with the graver alone, unaſſiſted by aquafortis. In this inſtance, the deſign is traced with a ſharp tool, called a *dry point*, upon the plate; and the ſtrokes are cut or ploughed upon the copper with an inſtrument diſtinguiſhed by the name of a *graver*.

In ſtrokes firſt etched and afterwards finiſhed with the graver: by this expedient the two former methods are united.

In dots without ſtrokes, which are executed with the point upon the wax or ground, bitten in with the aquafortis, and afterwards harmonized with the graver, by the means of which inſtrument ſmall dots are made; or with the graver alone, as in the fleſh and finer parts, unaſſiſted with the point.

In dots firſt etched and afterwards harmonized with the dry point, performed by a little hammer called *opus mallei*, or *the work of the hammer*, as practiſed by Lutma and others.

In mezzotinto, which is performed by a dark barb or ground being raiſed uniformly upon the plate with a toothed tool. The deſign being traced upon the plate, the light parts are ſcraped off by inſtruments for that purpoſe, in proportion as the effect requires.

In aquatinta, a newly invented method of engraving. The outline is firſt etched, and afterwards a ſort of waſh is laid by the aquafortis upon the plate, reſembling drawings in Indian ink, biſter, &c.

On wood, performed with a ſingle block, on which the deſign is traced with a pen, and thoſe parts which ſhould be white carefully hollowed out; and this block is afterwards printed by the letter-preſs printers, in the ſame manner as they print a book.

On wood, performed with two, three, or more blocks; the firſt having the outlines cut upon it; the ſecond is reſerved for the darker ſhadows; and the third for the ſhadows which terminate upon the lights; and theſe are ſubſtituted in their turn, each print receiving an impreſſion from every block. This mode of engraving is called *chiaro ſcuro*, and was deſigned to repreſent the drawings of the old maſters.

On wood and on copper: in theſe the outline is engraved in a bold dark ſtyle upon the copper; and two or more blocks of wood are ſubſtituted to produce the darker and lighter ſhadows, as before.

Of all theſe modes of engraving, the moſt ancient is that on *wood*; or, to ſpeak more properly, the firſt impreſſions on paper were taken from carved wooden blocks. For this invention it appears that we are indebted to the brief-malers or makers of playing-cards, who practiſed the art in Germany about the beginning of the 15th century. From the ſame ſource may perhaps be traced the firſt idea of moveable types, which appeared not many years after; for theſe brief-malers did not entirely confine themſelves to the printing and painting of cards, but produced alſo ſubjects of a more devout nature; many of which, taken from holy writ, are ſtill preſerved in different libraries in Germany, with the explanatory text facing the figures; the whole engraved in wood. In this manner they even formed a ſpecies of books; ſuch as, *Hiſtoria ſancti Johannis, ejuſque Viſiones Apocalypticæ; Hiſtoria Veteris & Novi Teſtamenti*, known by the name of the *Poor Man's Bible*. Theſe ſhort mementos were printed only on one ſide; and two of them being paſted together, had the appearance of a ſingle leaf. The earlieſt date on any of theſe wooden cuts is 1423. The ſubject is *St Chriſtopher carrying the Infant Jeſus over the Sea*, preſerved in a convent at Buxheim near Menningen. It is of a folio ſize, illuminated in the ſame manner as the playing cards; and at the bottom is this inſcription, *Criſtoferi faciem die quacunque tueris. Illa nempe die morte mala non morieris. Milleſimo CCCC° XX° tertio.*

Upon the invention of moveable types, that branch of the brief-malers buſineſs, ſo far as it regarded the making of books, was gradually diſcontinued; but the art itſelf of engraving on wood continued in an improving ſtate; and towards the end of the 15th and beginning of the 16th century, it became cuſtomary for almoſt every one of the German engravers on copper

*Strutt' Hiſt. o graving*

copper to engrave on wood alſo. The works of Albert Durer in this ſtyle of engraving are juſtly held in the higheſt eſteem. Italy, France, and Holland, have produced many capital artiſts of this kind; but for boldneſs and ſpirit, we muſt ſee the prints of Chriſtopher Jegher, who worked under the direction of Rubens, and was without doubt aſſiſted by that great maſter.

The invention of that ſpecies of engraving diſtinguiſhed by the appellation of *chiaro-ſcuro*, ſeems alſo to be juſtly claimed by the Germans, and firſt practiſed by Mair; one of whoſe prints of this kind is dated 1499. Many excellent works in chiaro-ſcuro have been produced in France; and in Italy it was honoured with the performances of Titian and Parmegiano; but the attempts of Jackſon, Kirkall, and others in England, have not been equally ſucceſsful. A ſet of excellent prints in this way have lately been publiſhed by J. Skippe, Eſq; a connoiſſeur and dillettante.

*ti's*
*of En-*
*ing.*

In Germany, about the year 1450, prints from engraved *copper* firſt made their appearance. The earlieſt date of a copperplate print is indeed only 1461; but however faulty this print may be with reſpect to the drawing, or defective in point of taſte, the mechanical part of the execution of it has by no means the appearance of being one of the firſt productions of the graver. We have alſo ſeveral other engravings, evidently the work of the ſame maſter; in which the impreſſions are ſo neatly taken from the plates, and the engravings ſo clearly printed in every part, that, according to all appearance, they could not be executed in a much better manner in the preſent day, with all the conveniences which the copperplate printers now poſſeſs, and the additional knowledge they muſt neceſſarily have acquired in the courſe of more than three centuries. Hence we may fairly conclude, that if they were not the firſt ſpecimens of the engravers workmanſhip, they were much leſs the firſt efforts of the copperplate printer's ability. It is likewiſe to be obſerved, that Martin Schoen, who is ſaid, with great appearance of truth, to have worked from 1460 to 1486, was apparently the ſcholar of Stoltzhirs; for he followed his ſtyle of engraving, and copied from him a ſet of prints, repreſenting the paſſion of our Saviour. Now, allowing Stoltzhirs to have preceded his diſciple only ten years, this carries the era of the art back to 1450, as was ſaid above. There is no ground to ſuppoſe that it was known to the Italians till at leaſt ten years afterwards. The earlieſt prints that are known to be theirs are a ſet of the ſeven planets, and an almanack by way of frontiſpiece; on which are directions for finding Eaſter from the year 1465 to 1517 incluſive: and we may be well aſſured, that the engravings were not antedated, for the almanack of courſe became leſs and leſs valuable every year. In all probability, therefore, theſe prints muſt have been executed in the year 1464; which is only four years later than the Italians themſelves lay any claim to. The three earlieſt Italian engravers are, Finiguerra, Boticelli, and Baldini. If we are to refer theſe prints to any of the three, we ſhall naturally conclude them to be the work of Finiguerra or Baldini; for they are not equal either in drawing or compoſition to thoſe aſcribed to Boticelli, which we know at leaſt were deſigned by him; and as Baldini is expreſsly ſaid to have worked from the deſigns of Boticelli, it will appear moſt probable that they belong to Finiguerra.

With reſpect to the invention of *etching*, it ſeems to be not well known to whom it is to be aſcribed. One of the moſt early ſpecimens is that print by Albert Durer, known by the name of the *Cannon*, dated 1518, and thought by ſome, with little foundation, to have been worked on a plate of iron. Another etching by the ſame artiſt is Moſes receiving the Tables of the Law, dated 1524. It was alſo practiſed in Italy ſoon after this by Parmegiano, in whoſe etchings we diſcover the hand of the artiſt working out a ſyſtem as it were from his own imagination, and ſtriving to produce the forms he wanted to expreſs. We ſee the difficulty he laboured under; and cannot doubt, from the examination of the mechanical part of the execution of his works, that he had no inſtruction; and that it was ſomething entirely new to him. If the ſtory is true, that he kept an engraver by profeſſion in his houſe, the novelty of the art is rendered ſo much the more probable. He died in 1540

As to that ſpecies of engraving in which the modes of *etching* and *cutting* with the graver are united, it muſt have been found neceſſary immediately upon the invention of etching; it was, however, firſt carried to perfection by G. Audran, and is now almoſt univerſally practiſed, whether the work is in ſtrokes or in dots.

Engraving in *dots*, the preſent faſhionable method, is a very old invention, and the only mode diſcovered by the Italians. Agoſtino de Muſis, commonly called *Auguſtine of Venice*, a pupil of Marc Antonio, uſed it in ſeveral of his earlieſt works, but confined it to the fleſh, as in the undated print of An Old Man ſeated upon a Bank, with a Cottage in the back ground. He flouriſhed from 1509 to 1536. We alſo find it in a print of "A ſingle Figure ſtanding, holding a Cup and looking upwards," by Giulio Campagnola, who engraved about the year 1516. The back ground is executed with round dots, made apparently with a dry point. The figure is outlined with a ſtroke deeply engraved, and finiſhed with dots, in a manner greatly reſembling thoſe prints which Demarteau engraved at Paris in imitation of red chalk. The hair and beard are expreſſed by ſtrokes. Stephen de Laulne, a native of Germany, followed the ſteps of Campagnola; and many of his ſlight works are executed in dots only. John Boulanger, a French artiſt, who flouriſhed in the middle of the laſt century, and his contemporary Nicholas Van Plattenberg, improved greatly on this method, and practiſed it with much ſucceſs. It is only, however, of late, that it has been conſidered as an object worthy of general imitation. John Lutma executed this kind of work with a hammer and a ſmall punch or chiſſel.

The method of engraving in *mezzotinto* was invented about the middle of the 17th century; and the invention has generally been attributed to Prince Rupert, though it has alſo been aſſerted that he learnt the ſecret from another. See Mezzotinto.

Engraving in *aquatinta* is quite a recent invention, and ſeems at once to have been carried to perfection by Sandby and other living artiſts. See Aquatinta.

Engraving with the tool was the kind originally practiſed, and it is yet retained for many purpoſes. For though the manœuvre of etching be more eaſy, and other advantages attend it; yet where great regularity and exactneſs of the ſtroke or lines are required, the working with the graver is much more effectual: on which account it is more ſuitable to the preciſion neceſſary in the execution of portraits; as there every thing the moſt minute muſt be made out and expreſſed, according to the original ſubject, without any licenſe to the fancy of the deſigner in deviating from it, or varying the effect either by that maſterly negligence and ſimplicity in ſome parts, or thoſe bold ſallies of the imagination and hand in others, which give ſpirit and force to hiſtory-painting.

The principal inſtruments uſed in engraving with the tool are, gravers, ſcrapers, a burniſher, an oil-ſtone, and a cuſhion for bearing the plates.

Gravers are made in ſeveral forms with reſpect to the points, ſome being ſquare, others lozenge; the ſquare graver for cutting broad and deep, and the lozenge for more delicate and fine ſtrokes and hatches. La Boſſe recommends, as the moſt generally uſeful, ſuch as are of a form betwixt the ſquare and lozenge: and he adviſes, that they ſhould be of a good length; ſmall towards the point, but ſtronger upwards, that they may have ſtrength enough to bear any ſtreſs there may be occaſion to lay upon them: for if they be too ſmall and mounted high, they will bend; which frequently cauſes their breaking, eſpecially if they be not employed for very ſmall ſubjects.

The burniſher is uſed to aſſiſt in the engraving on ſome occaſions, as well as to poliſh the plates. It is ſeven inches in length, and made of fine ſteel well poliſhed. The burniſher is formed at one end, and a ſcraper on the other, each about an inch and a half long from the point: betwixt them, about four inches of the inſtrument is made round, and ſerves as a handle; and is thicker in the middle than at the necks, where the burniſher and ſcraper begin, which necks are only one quarter of an inch in diameter. The principal application of it in engraving, beſides its uſe in poliſhing the plates, is to take out any ſcratches or accidental defacings that may happen to the plates during the engraving; or to leſſen the effect of any parts that may be too ſtrongly marked in the work, and require to be taken down.

A cuſhion, as it is called, is likewiſe generally uſed for ſupporting the plate in ſuch a manner, that it may be turned every way with eaſe. It is a bag of leather filled with ſand, which ſhould be of the ſize that will beſt ſuit the plates it is intended to bear. They are round, and about nine inches over, and three inches in thickneſs.

The cuſhion, made as above directed, being laid on the table, the plate muſt be put upon it; and the graver being held in the hand in a proper manner, the point muſt be applied to the plate, and moved in the proper direction for producing the figures of the lines intended: obſerving, in forming ſtraight lines, to hold the plate ſteady on the cuſhion; and where they are to be finer, to preſs more lightly, uſing greater force where they are to be broader and deeper. In making circular or other curve lines, hold your hand and graver ſteadily; and as you work, turn your plate upon the cuſhion againſt your graver, otherwiſe it will be impoſſible for you to make any circular or curved line with that neatneſs and command of hand you by this means may. After part of the work is engraved, it is neceſſary to ſcrape it with the ſcraper or graver, paſſed in the moſt level direction over the plate to take off the roughneſs formed by the cutting of the graver; but great care muſt be taken not to incline the edge of the ſcraper or tool uſed, in ſuch a manner that it may take the leaſt hold of the copper, as it would otherwiſe produce falſe ſtrokes or ſcratches in the engraving; and that the engraved work may be rendered more viſible, it may afterwards be rubbed over with a roll of felt dipped in oil. In uſing the graver, it is neceſſary to carry it as level as poſſible with the ſurface of the plate; for otherwiſe, if the fingers ſlip betwixt them, the line that will be produced, whether curve or ſtraight, will become deeper and deeper in the progreſs of its formation; which entirely prevents ſtrokes being made at one cut, that will be fine at their extremities, and larger in the middle; and occaſions the neceſſity of retouching to bring them to that ſtate. For this reaſon, it is very neceſſary for thoſe who would learn to engrave in perfection, to endeavour, by frequent trials, to acquire the habit of making ſuch ſtrokes both ſtraight and curving, by lightening or ſinking the graver with the hand, according to the occaſion. If, after finiſhing the deſign, any ſcratches appear, or any part of the engraving be falſely executed, ſuch ſcratches, or faulty parts, muſt be taken out by the burniſher, and further poliſhed, if neceſſary, by the above mentioned roll.

The plate being thus engraved, it is proper to round off the edges, by uſing firſt a rough file, and afterwards a ſmoother; and to blunt the corners a little by the ſame means: after which, the burniſher ſhould be paſſed over the edges to give it a farther poliſh.

The dry point, or needle, which has been of late much uſed in engraving, is a tool like an etching point, which being drawn hard on the copper, cuts a ſtroke, and raiſes a burr; the burr is ſcraped off, and there remains a ſtroke more ſoft and delicate than can be produced in any other way.

In the conduct of the graver and dry point conſiſts all the art; for which there are no rules to be given; all depending on the habitude, diſpoſition, and genius, of the artiſt. However, beſides the explanations already given, ſome general obſervations and directions may not be improper. As the principles of engraving are the ſame with thoſe of painting, a perſon cannot expect to attain any conſiderable degree of perfection in this art who is not a good maſter of deſign; and therefore he ought to be well acquainted both with perſpective and architecture: for the former, by the proper gradations of ſtrong and faint colours, will enable him to throw backwards the figures and other objects of the picture or deſign which he propoſes to imitate; and the latter will teach him to preſerve the due proportion of its ſeveral orders, which the painter often entruſts to the diſcretion of the engraver. In order to preſerve equality and union in his works, the engraver ſhould always ſketch out the principal objects of his piece before he undertakes to finiſh them. In working, the ſtrokes of the graver ſhould never be croſſed too much in a lozenge manner, particularly in the

the repreſentation of fleſh, becauſe ſharp angles produce the unpleaſing effect of lattice-work, and take from the eye the repoſe which is agreeable to it in all kinds of pictureſque deſigns: we ſhould except the caſe of clouds, tempeſts, waves of the ſea, the ſkins of hairy animals, or the leaves of trees, where this method of croſſing may be admitted. But in avoiding the lozenge, it is not proper to get entirely into the ſquare, which would give too much of the hardneſs of ſtone. In conducting the ſtrokes, the action of the figures, and of all their parts, ſhould be conſidered; and it ſhould be obſerved how they advance towards, or recede from the eye; and the graver ſhould be guided according to the riſings or cavities of the muſcles or folds, making the ſtrokes wider and fainter in the light, and cloſer and firmer in the ſhades. Thus the figures will not appear jagged; and the hand ſhould be lightened in ſuch a manner, that the outlines may be formed and terminated without being cut too hard; however, though the ſtrokes break off where the muſcle begins, yet they ought always to have a certain connection with each other, ſo that the firſt ſtroke may often ſerve by its return to make the ſecond, which will ſhow the freedom of the engraver.

In engraving the fleſh, the effect may be produced in the lighter parts and middle tints by long pecks of the graver, rather than by light lines; or by round dots; or by dots a little lengthened by the graver; or, beſt of all, by a judicious mixture of theſe together.

In engraving the hair and the beard, the engraver ſhould begin his work by laying the principal grounds, and ſketching the chief ſhades in a careleſs manner, or with a few ſtrokes; and he may finiſh it at leiſure with finer and thinner ſtrokes to the extremities. When architecture or ſculpture is to be repreſented, except it be old and ruinous buildings, the work ought not to be made very black; becauſe, as edifices are commonly conſtructed either of ſtone or white marble, the colour, being reflected on all ſides, does not produce dark or brown ſhades as in other ſubſtances. White points muſt not be put in the pupils of the eyes of figures, as in engravings after paintings; nor muſt the hair or beard be repreſented as in nature, which makes the locks appear flowing in the air; becauſe in ſculpture there can be no ſuch appearances.

In engraving cloths of different kinds, linen ſhould be done with finer and cloſer lines than other ſorts, and be executed with ſingle ſtrokes. Woollen cloth ſhould be engraved wide, in proportion to the coarſeneſs or fineneſs of the ſtuff, and with only two ſtrokes; and when the ſtrokes are croſſed, the ſecond ſhould be ſmaller than the firſt, and the third than the ſecond. Shining ſtuffs, which are generally of ſilk or ſatin, and which produce flat and broken folds, ſhould be engraved more hard and more ſtraight than others, with one or two ſtrokes, as their colours are bright or brown; and between the firſt ſtrokes other ſmaller muſt be joined, which is called interlining. Velvet and pluſh are expreſſed in the ſame manner, and ſhould always be interlined. Metals, as armour, &c. are alſo repreſented by interlining, or by clear ſingle ſtrokes. In architecture, the ſtrokes which form the rounding object ſhould tend to the point of ſight; and when whole columns occur, it is proper to produce the effect as much as poſſible by perpendicular ſtrokes. If a groſs ſtroke is put, it ſhould be at right angles, and wider and thinner than the firſt ſtroke. In engraving mountains, the ſtrokes ought to be frequently diſcontinued and broken, for ſharp and craggy objects; and they ſhould be ſtraight, in the lozenge manner, and accompanied with long points or dots; and rocks ſhould be repreſented by croſs ſtrokes more ſquare and even. Objects that are diſtant towards the horizon ſhould be kept very tender, and ſlightly charged with black. Waters that are calm and ſtill are beſt repreſented by ſtrokes that are ſtraight, and parallel to the horizon, interlined with thoſe that are finer; omitting ſuch places as, in conſequence of gleams of light, exhibit the ſhining appearance of water; and the form of objects reflected from the water, at a ſmall diſtance upon it, or on the banks of the water, are expreſſed by the ſame ſtrokes, retouched more ſtrongly or faintly as occaſion may require, and even by ſome that are perpendicular. For agitated waters, as the waves of the ſea, the firſt ſtrokes ſhould follow the figure of the waves, and may be interlined, and the croſs ſtrokes ought to be very lozenge. In caſcades, the ſtrokes ſhould follow the fall, and be interlined. In engraving clouds, the graver ſhould ſport when they appear thick and agitated, in turning every way according to their form and their agitation. If the clouds are dark, ſo that two ſtrokes are neceſſary, they ſhould be croſſed more lozenge than the figures, and the ſecond ſtrokes ſhould be rather wider than the firſt. The flat clouds, that are loſt inſenſibly in the clear ſky, ſhould be made by ſtrokes parallel to the horizon, and a little waving; if ſecond ſtrokes are required, they ſhould be more or leſs lozenge; and when they are brought to the extremity, the hand ſhould be ſo lightened, that they may form no outline. The flat and clear ſky is repreſented by parallel and ſtraight ſtrokes, without the leaſt turning. In landſcapes, the trees, rocks, earth, and herbage, ſhould be etched as much as poſſible; nothing ſhould be left for the graver but perfecting, ſoftening, and ſtrengthening. The dry point produces an effect more delicate than the graver can, and may be uſed to great advantage in linen, ſkies, diſtances, ice, and often in water, eſpecially in ſmall engravings. In moſt things it is proper to etch the ſhadows, only leaving the lighter tints for the dry point, graver, &c.

To imitate *chalk-drawings*, a mixture of varied and irregular dots are uſed, made more or leſs ſoft, ſo as to reſemble the grain produced by the chalks on paper. Every ſtroke of the chalks on paper may be conſidered as an infinite number of adjoining points, which are the ſmall eminences of the grain of the paper touched by the chalk in paſſing over it. When the copper-plate has been poliſhed and varniſhed, or properly prepared, as in the common method of engraving, the drawing to be imitated may be counterproved on the varniſh of the plate. If this cannot be conveniently done, black lead pencil, or red chalk, muſt be applied to varniſhed or oiled paper; and by means of this chalk or pencil, all the traces of the original will be tranſmitted to the varniſh. The outlines of the object muſt be formed in the etching by points, whoſe magnitude and diſtance muſt be determined by the quality of the ſtrokes in the original drawing. The artiſt may be provided with pointed inſtruments or needles of various ſizes with ſingle or double points. In forming the light and ſhade, he ſhould diſtinguiſh between thoſe hatches which ſerve to expreſs the perſpective of the object and thoſe which form the ground of it. The principal hatches ſhould be more ſtrongly marked; the middle tints, if etched, ſhould be marked lightly, or they may be left till the varniſh is taken off, and be perfected with a greater degree of ſoftneſs, by needles or the point of the graver, as the original may require. There is nothing peculiar in the method of applying the aquafortis in this kind of engraving; but it may be obſerved, that it ſhould not be left ſo long as to corrode the lighter parts too much: if the light parts are ſufficiently corroded, they may be ſtopped out with turpentine varniſh and lamp-black mixed together, and the aquafortis may be applied again to the ſtronger parts; for it will be no detriment to them, if the points which compoſe the ſhade burſt into one another, provided the extreme be avoided. When the work of the aquafortis is finiſhed, and the varniſh taken off the copper, it will be neceſſary in the ſofteſt parts, ſuch as the fleſh, &c. to interſtipple with proper points; as an effect will be thus produced more delicate than it is poſſible to attain with the aquafortis only; and the ſtrongeſt ſhades will require additional ſtrength to be given them with ſmall ſtrokes of the graver. Drawings made with chalks of different colours may be imitated in this manner, if a plate be provided for every colour.—This method of engraving is intended to form a kind of deception, ſo that the connoiſſeur may not be able, on the firſt inſpection, to diſtinguiſh between the original drawing and the engraving made in imitation of it; and it is extremely uſeful, as it ſerves to multiply copies of drawings left by thoſe maſters who excelled in the uſe of chalks, and thus to form and improve young artiſts, who could not have acceſs to the originals in the practice of drawing.

*Engraving upon Glaſs.* See Chemistry, 2d N°857.

Engraving *on Precious Stones*, is the repreſenting of figures, or devices, in relievo or indented, on divers kinds of hard poliſhed ſtones.

The art of engraving on precious ſtones is one of thoſe wherein the ancients excelled; there being divers antique agates, cornelians, and onyxes, which ſurpaſs any thing of that kind the moderns have produced. Pyrgoteles among the Greeks, and Dioſcorides under the firſt emperors of Rome, are the moſt eminent engravers we read of: the former was ſo eſteemed by Alexander, that he forbad any body elſe to engrave his head; and Auguſtus's head, engraven by the latter, was deemed ſo beautiful, that the ſucceeding emperors choſe it for their ſeal.

All the polite arts having been buried under the ruins of the Roman empire, the art of engraving on ſtones met with the ſame fate. It was retrieved in Italy at the beginning of the 15th century, when one John of Florence, and after him Dominic of Milan, performed works of this kind no way to be deſpiſed. From that time, ſuch ſculptures became common enough in Europe, and particularly in Germany, whence great numbers were ſent into other countries: but they came ſhort of the beauty of thoſe of the ancients, eſpecially thoſe on precious ſtones; for, as to thoſe on cryſtal, the Germans, and, after their example, the French, &c. have ſucceeded well enough.

In this branch of engraving, they make uſe either of the diamond or of emery.

The diamond, which is the hardeſt of all ſtones, is only cut by itſelf, or with its own matter. The firſt thing to be done in this branch of engraving is, to cement two rough diamonds to the ends of two ſticks big enough to hold them ſteady in the hand, and to rub or grind them againſt each other till they be brought to the form deſired. The duſt or powder that is rubbed off ſerves afterwards to poliſh them, which is performed with a kind of mill that turns a wheel of ſoft iron. The diamond is fixed in a braſs diſh; and, thus applied to the wheel, is covered with diamond duſt, mixed up with oil of olives; and when the diamond is to be cut facet-wiſe, they apply firſt one face, then another, to the wheel. Rubies, ſapphires, and topazes, are cut and formed the ſame way on a copper wheel, and poliſhed with tripoli diluted in water. As to agates, amethyſts, emeralds, hyacinths, granites, rubies, and others of the ſofter ſtones, they are cut on a leaden wheel, moiſtened with emery and water, and poliſhed with tripoli on a pewter wheel. Lapis-lazuli, opal, &c. are poliſhed on a wooden wheel. To faſhion and engrave vaſes of agate, cryſtal, lapis lazuli, or the like, they make uſe of a kind of lathe, like that uſed by pewterers, to hold the veſſels, which are to be wrought with proper tools: that of the engraver generally holds the tools, which are turned by a wheel; and the veſſel is held to them to be cut and engraved, either in relievo or otherwiſe; the tools being moiſtened from time to time with diamond duſt and oil, or at leaſt emery and water. To engrave figures or devices on any of theſe ſtones, when poliſhed, ſuch as medals, ſeals, &c. they uſe a little iron wheel, the ends of whoſe axis are received within two pieces of iron, placed upright, as in the turner's lathe; and to be brought cloſer, or ſet further apart, at pleaſure; at one end of the axis are fitted the proper tools, being kept tight by a ſcrew. Laſtly, The wheel is turned by the foot, and the ſtone applied by the hand to the tool, and is ſhifted and conducted as occaſion requires.

The tools are generally of iron, and ſometimes of braſs; their form is various, but it generally bears ſome reſemblance to chiſels, gouges, &c. Some have ſmall round heads, like buttons, others like ferrels, to take the pieces out, and others flat, &c. When the ſtone has been engraven, it is poliſhed on wheels of hair-bruſhes and tripoli.

*Engraving on Steel* is chiefly employed in cutting ſeals, punches, matrices, and dyes, proper for ſtriking coins, medals, and counters. The method of engraving with the inſtruments, &c. is the ſame for coins as for medals and counters: All the difference conſiſts in their greater or leſs relievo; the relievo of coins being much leſs conſiderable than that of medals, and that of counters ſtill leſs than that of coins.

Engravers in ſteel commonly begin with punches, which are in relievo, and ſerve for making the creux or cavities of the matrices and dyes: though ſometimes they begin with the creux or hollowneſs; but then it is only when the intended work is to be cut very

very ſhallow. The firſt thing done, is that of deſigning the figures; the next is the moulding them in wax, of the ſize and depth they are to lie, and from this wax the punch is engraven. When the punch is finiſhed, they give it a very high temper, that it may the better bear the blows of the hammer with which it is ſtruck to give the impreſſion to the matrice.

The ſteel is made hot to ſoften it, that it may the more readily take the impreſſion of the punch; and after ſtriking the punch on it in this ſtate, they proceed to touch up or finiſh the ſtrokes and lines, where by reaſon of their fineneſs or the too great relievo they are any thing defective, with ſteel gravers of different kinds, chiſels, flatters, &c. being the principal inſtruments uſed in graving on ſteel.

The figure being thus finiſhed, they proceed to engrave the reſt of the medal, as the mouldings of the border, the engrailed ring, letters, &c with little ſteel punches, well tempered, and very ſharp.

ENGUICHE', in heraldry, is ſaid of the great mouth of a hunting horn, when its rim is of a different colour from that of the horn itſelf.

ENHARMONIC, in muſic. The Greeks had three different ſpecies of muſic; the *diatonic*, the *chromatic*, and the *enharmonic*. This laſt was eſteemed by much the moſt agreeable and powerful of the three; but the difficulty of its execution rendered its duration ſhort, and latter artiſts were upbraided for having ſacrificed it to their indolence. It proceeded upon leſſer intervals than either the diatonic or chromatic; and as the chromatic ſemitone is ſtill leſs than the diatonic, the *enharmonic* intervals muſt have conſiſted of that ſemitone divided into parts more minute. In Rouſſeau's Muſical Dictionary (at the word *Enharmonique*), the reader may ſee how that interval was found in the tetrachords of the ancients. It is by no means eaſy for modern ears, inured to intervals ſo widely different, to imagine how a piece of muſic, whoſe tranſitions were formed either chiefly or ſolely upon ſuch minute diviſions, could have ſuch wonderful effects; yet the melody of ſpeech, which riſes or falls by intervals ſtill more minute than the enharmonic, when properly modulated and applied with taſte, has an aſtoniſhing power over the ſoul. As to the modern *enharmonic* ſyſtem, we may likewiſe refer the reader to the ſame work for an account of its nature and uſe; though he will find it accurately and clearly explained by D'Alembert, in the Treatiſe of Music given in the preſent work, (art. 144. 145. 146.)

ENHYDRUS, in natural hiſtory, a genus of ſiderochita or cruſtated ferruginous bodies, formed in large and in great part empty caſes, incloſing a ſmall quantity of an aqueous fluid.

Of this genus there are only two ſpecies: 1. The thick-ſhelled enhydrus, with black, reddiſh-brown, and yellow cruſts. 2. The thinner-ſhelled kind, with yellowiſh-brown and purple cruſts; neither of which ferments with aquafortis or gives fire with ſteel.

ENIGMA. See Ænigma.

ENIXUM, among chemiſts, a kind of natural ſalt, generated of an acid and an alkali.

The ſal enixum of Paracelſus, is the caput mortuum of ſpirits of nitre with oil of vitriol, or what remains in the retort after the diſtillation of this ſpirit; being of a white colour, and pleaſing acid taſte.

ENMANCHE', in heraldry, is when lines are drawn from the centre of the upper edge of the chief to the ſides, to about half the breadth of the chief; ſignifying ſleeved, or reſembling a ſleeve, from the French *manche*.

ENNA, (anc. geog.), a town of Sicily, ſituated on an eminence to the ſouth of the Chryſas; called the *centre of Sicily*. It was famous for a ſacred grove, in which the rape of Proſerpina happened; for a temple of Ceres, thence ſurnamed *Ennæa*, and *Ennenſis*; and for fine ſprings, whence the name (Bochart.)

ENNEAGON, in geometry, a polygon with nine ſides. See Polygon.

ENNEAHEDRIA, in natural hiſtory, a genus of columnar, cryſtalliform, and double-pointed ſpars, compoſed of a trigonal column, terminated at each end by a trigonal pyramid.

Of this genus there are ſeveral ſpecies, diſtinguiſhed by the length or ſhortneſs of the column and pyramids, none of which give fire with ſteel, but all of them ferment with aquafortis. See Spar.

ENNEANDRIA, in botany (from εννεα *nine*, and ανηρ a *man* or *huſband*), the name of the ninth claſs in Linnæus's ſexual ſyſtem, conſiſting of plants which have hermaphrodite flowers with nine ſtamina or male organs. See Botany, p. 430. the *Scheme*.

ENNIUS (Quintus), an ancient Latin poet, born at Rudii, a town in Calabria. He came firſt to Rome when M. Porcius Cato was queſtor, whom he had inſtructed in the Greek language in Sardinia; and by his genius and behaviour he gained the eſteem of the moſt eminent perſons in the city. According to Horace, Ennius never applied himſelf to writing till he had drank freely of wine. Hence he contracted the gout, of which he died nine years B. C. He was interred in Scipio's ſepulchre; who had a great eſteem and friendſhip for him, and cauſed a ſtatue to be erected to him upon his monument. He endeavoured to introduce the treaſures of the Greek tongue among the Latins, and was the firſt among the Romans who made uſe of heroic verſes. He wrote the *Annals of Rome*; he tranſlated ſeveral tragedies from the Greek, and wrote others, beſide ſeveral comedies. We have only ſome fragments of his works, which were firſt collected by the two Stephens, and afterwards publiſhed at Naples, with a learned commentary, by Jerom Columna, in quarto, 1590; and reprinted at Amſterdam in 1707, in quarto, with additions by Heſſelius.

ENOCH, the ſon of Cain (Gen. iv. 17.), in honour of whom the firſt city taken notice of in ſcripture was called *Enoch* by his father Cain, who built it. It was ſituated to the eaſt of the province of Eden.

Enoch, the ſon of Jared and father of Methuſelah, was born in the year of the world 622. At the age of 65 he begat Methuſelah, and lived 300 years after, and had ſeveral ſons and daughters. Enoch walked with God; and after that he had lived in all 365 years, "he was not, for God took him." Some conſtrue theſe laſt words, as if they intimated that Enoch died a natural death, becauſe in reality he lived not near ſo long as the other patriarchs of thoſe times; as if God, to ſecure him from corruption, had been pleaſed to take him early out of this world. But the generality of the fathers and commentators aſſert that he died not, but was tranſlated out of the ſight of men, in like manner as Elijah was. The apoſtle Paul (Heb. xi. 5.) ſhows very clearly that Enoch was tranſlated, and did not ſee death.

The apoſtle Jude (ver. 14, 15.) cites a paſſage from the book of Enoch, which has very much exerciſed interpreters. The queſtion is, whether the apoſtle took this paſſage out of any particular book written by Enoch, which might be extant in the firſt ages of the church? whether he received it by tradition? or laſtly, by ſome particular revelation? It is thought probable, that he read it in the book we have been ſpeaking of, which, tho' apocryphal, might contain ſeveral truths that St Jude, who was favoured with a ſupernatural degree of underſtanding, might make uſe of to the edification of the faithful.

The ancients greatly eſteemed the prophecy of Enoch. Tertullian expreſſes his concern, that it was not generally received in the world. That father, on the authority of this book, deduces the original of idolatry, aſtrology, and unlawful arts, from the revolted angels, who married with the daughters of men. St Auguſtin allows indeed that Enoch wrote ſomething divine, becauſe he is cited by St Jude; but he ſays it was not without reaſon that this book was not inſerted in the canon which was preſerved in the temple at Jeruſalem. This father ſufficiently inſinuates, that the authority of this book is doubtful, and that it cannot be proved that it was really written by Enoch. Indeed the account it gives of giants engendered by angels, and not by men, has manifeſtly the air of a fable, and the moſt judicious critics believe it ought not to be aſcribed to Enoch.

This apocryphal book lay a long time buried in darkneſs, till the learned Joſeph Scaliger recovered a part of it. Scaliger, Voſſius, and other learned men, attribute this work to one of thoſe Jews who lived between the time of the Babyloniſh captivity and that of Jeſus Chriſt. Others are of opinion, that it was written after the riſe and eſtabliſhment of Chriſtianity, by one of thoſe fanatics with whom the primitive church was filled, who made a ridiculous mixture of the Platonic philoſophy and the Chriſtian divinity.

The eaſtern people, who call Enoch by the name of *Edris*, believe that he received from God the gift of wiſdom and knowledge; and that God ſent him 30 volumes from heaven, filled with all the ſecrets of the moſt myſterious ſciences. The Rabbins maintain, that when Enoch was tranſlated to heaven, he was admitted into the number of the angels, and is the perſon generally known by the name of *Michael*.

ENORMOUS, ſomething exceſſive or monſtrous, eſpecially in bulk.—The word is formed of the privative *e*, and *norma*, "rule;" q. d. "void of, or contrary to, rule or meaſure;" *contra normam*. In the corrupt ages of Latinity, they uſed *innormis*, and *inormis*.

In the French juriſprudence, *læſio enormis*, "enormous damage," is that which exceeds half the value of the thing ſold.

ENOS, the ſon of Seth and father of Cainan, was born in the year of the world 235. Moſes tells us (Gen. iv. 26.), that then "*men* began to call upon the name of the Lord;" or, as others tranſlate it, that "Enos began to call upon the name of the Lord;" that is to ſay, that he was the inventor of religious rites and ceremonies in the external worſhip which was paid to God. This worſhip was kept up and preſerved in Enos's family, while Cain's family was plunged in all manner of irregularities and impieties. Several Jews are of opinion, that idolatry was at firſt introduced into the world in the time of Enos. They tranſlate the Hebrew thus, "Then men began to profane the name of the Lord." Good men, to diſtinguiſh themſelves from the wicked, began to take upon them the quality of ſons or ſervants of God; for which reaſon, Moſes (Gen. vi. 1, 2.) ſays, that *the ſons of God* (that is to ſay, the deſcendants of Enos, who had hitherto preſerved the true religion), ſeeing the daughters of men, that they were fair, took them wives of all which they choſe. Enos died at the age of 905 years, in the year of the world 1140.

ENS, among metaphyſicians, denotes entity, being, or exiſtence: this the ſchools call *ens reale*, and *ens poſitivum*; to diſtinguiſh it from their *ens rationis*, which is only an imaginary thing, or exiſts but in the imagination.

Ens, among chemiſts, imports the power, virtue, and efficacy, which certain ſubſtances exert upon our bodies.

Ens, in geography, a city of Germany, ſituated at the confluence of the Danube and the river Ens, about 80 miles ſouth of Vienna. E. Long. 14. 20. N. Lat. 48. 16.

ENSATÆ, in botany (from *enſis*, "a ſword"); the name of the ſixth order in Linnæus's natural method, conſiſting of plants with ſword-ſhaped leaves *. It contains the following genera, viz. Antholyza, Calliſia, Commelina, Crocus, Eriocaulon, Ferraria, Gladiolus, Iris, Ixia, Moræa, Pontæderia, Siſyrinchium, Tradeſcantia, Wachendorffa, Xyris.

ENSEELED, in falconry, is ſaid of a hawk that has a thread drawn through her upper eye-lid, and made faſt under her beak, to take away the ſight.

ENSEMBLE, a French term, ſometimes uſed in our language; literally ſignifying *together*, or *one with another*:—being formed from the Latin *in* and *ſimul*.

In architecture, we ſay *the enſemble*, or *tout enſemble*, of a building; meaning the whole work, or compoſition, conſidered together, and not in parts; and ſometimes alſo, the relative proportion of the parts to the whole.—"All thoſe pieces of building make a fine *enſemble*."

To judge well of a work, a ſtatue, or other piece of ſculpture, one muſt firſt examine whether the *enſemble* be good. The *tout enſemble* of a painting, is that harmony which reſults from the diſtribution of the ſeveral objects or figures whereof it is compoſed.—"This picture is good, taking the parts ſeparately; but the *tout enſemble* is bad."

ENSIFORMIS CARTILAGO. See XIPHOIDES.

ENSIGN, in the military art, a banner or colours under which ſoldiers are ranged, according to the different companies or parties they belong to. See FLAG, COLOURS, STANDARD, &c.

The Turkiſh enſigns are horſes tails; thoſe of the Europeans are pieces of taffety, with divers figures, colours, arms, and devices thereon. Xenophon tells us, that the enſign bore by the Perſians was a golden eagle on a white flag; the Corinthians bore the winged horſe, or Pegaſus, in theirs; the Athenians, an owl;

* See *tany*, p col. 2.

the Meſſenians, the Greek letter M; the Lacedæmonians, the Λ. The Romans had a great diverſity of enſigns; the wolf, minotaur, horſe, boar, and at length the eagle, where they ſtopped: this was firſt aſſumed in the ſecond year of the conſulate of Marius †. A military enſign on a medal of a Roman colony, denotes it a colony peopled with old ſoldiers.

Ensign is alſo the officer that carries the colours, being the loweſt commiſſioned officer in a company of foot, ſubordinate to the captain and lieutenant. It is a very honourable and proper poſt for a young gentleman at his firſt coming into the army: he is to carry the colours both in aſſault, day of battle, &c. and ſhould not quit them but with his life: he is always to carry them himſelf on his left ſhoulder: only on a march he may have them carried by a ſoldier. If the enſign is killed, the captain is to carry the colours in his ſtead.

*Naval Ensign*, a large ſtandard or banner hoiſted on a long pole erected over the poop, and called the *enſign ſtaff*.—The enſign is uſed to diſtinguiſh the ſhips of different nations from each other, as alſo to characteriſe the different ſquadrons of the navy. The Britiſh enſign in ſhips of war is known by a double croſs, viz. that of St George and St Andrew, formed upon a field which is either red, white, or blue.

ENSISHEIM, a town of France, in Upper Alſace. It is a pretty little place, well built, and conſiſts of about 200 houſes. E. Long. 7. 41. N. Lat. 47. 49.

ENT (Sir George), an eminent Engliſh phyſician, born at Sandwich in Kent in 1604. He was educated at Sidney college, Cambridge; and, afterwards travelling into foreign countries, received the degree of doctor of phyſic at Padua. After his return he obtained great practice, was made preſident of the college of phyſicians in London, and at length received the honour of knighthood from King Charles II. He was extremely intimate with Doctor Harvey; whom he learnedly defended in a piece intitled, *Apologia pro Circulatione Sanguinis, contra Æmilium Pariſanum.* He alſo publiſhed, *Animadverſiones in Malachiæ Thruſtoni;* and ſome obſervations in the Philoſophical Tranſactions. Glanville, ſpeaking of his Plus Ultra of the modern improvements in anatomy, numbers Sir George Ent, Doctor Gliſſon, and Doctor Wallis, with the moſt celebrated diſcoverers in that ſcience. The two former were among the firſt members of the Royal Society. Sir George Ent died in October 1689.

ENTABLATURE, or Entablement, in architecture, is that part of an order of a column which is over the capital, and comprehends the architrave, frieze, and corniche. See Architecture, chap i.

ENTABLER, in the manege, the fault of a horſe whoſe croupe goes before his ſhoulders in working upon volts; which may be prevented by taking hold of the right rein, keeping your right leg near, and removing your left leg as far from the horſe's ſhoulder as poſſible.

This is always accompanied with another fault called *aculer*. See Aculer.

ENTAIL, in law, ſignifies *feetail*, or *fee entailed;* that is, abridged, curtailed, or limited, to certain conditions. See Fee, and Tail.

ENTE', in heraldry, a method of marſhalling, more frequent abroad than with us, and ſignifying grafted or ingrafted.

We have, indeed, one inſtance of enté in the fourth grand quarter of his majeſty's royal enſign, whoſe blazon is Brunſwick and Lunenburg impaled with ancient Saxony, *enté en pointé*, "grafted in point."

ENTEROCELE, in ſurgery, a tumor formed by a prolapſion of the inteſtines through the rings of the abdomen and proceſſes of the peritonæum, into the ſcrotum. See Surgery.

ENTHUSIASM, an ecſtaſy of the mind, whereby it is led to think and imagine things in a ſublime, ſurpriſing, yet probable manner. This is the enthuſiaſm felt in poetry, oratory, muſic, painting, ſculpture, &c.

Enthusiasm, in a religious ſenſe, implies a tranſport of the mind, whereby it fancies itſelf inſpired with ſome revelation, impulſe, &c. from heaven. Mr Locke gives the following deſcription of enthuſiaſm. "In all ages, men in whom melancholy has mixed with devotion, or whoſe conceit of themſelves has raiſed them into an opinion of a great familiarity with God, and a nearer admittance to his favour than is afforded to others, have often flattered themſelves with a perſuaſion of an immediate intercourſe with the Deity, and frequent communications from the Divine Spirit. Their minds being thus prepared, whatever groundleſs opinion comes to ſettle itſelf ſtrongly upon their fancies, is an illumination from the Spirit of God. And whatſoever odd action they find in themſelves a ſtrong inclination to do, that impulſe is concluded to be a call or direction from heaven, and muſt be obeyed. It is a commiſſion from above, and they cannot err in executing it. This I take to be properly enthuſiaſm, which, though ariſing from the conceit of a warm and overweening brain, works, when it once gets footing, more powerfully on the perſuaſions and actions of men, than either reaſon or revelation, or both together; men being moſt forwardly obedient to the impulſes they receive from themſelves." Devotion, when it does not lie under the check of reaſon, is apt to degenerate into enthuſiaſm. When the mind finds itſelf inflamed with devotion, it is apt to think that it is not of its own kindling, but blown up with ſomething divine within it. If the mind indulges this thought too far, and humours the growing paſſion, it at laſt flings itſelf into imaginary raptures and ecſtaſies; and when once it fancies itſelf under the influence of a divine impulſe, no wonder if it ſlights human ordinances, and refuſes to comply with the eſtabliſhed form of religion, as thinking itſelf directed by a much ſuperior guide.

ENTHUSIAST, a perſon poſſeſſed with enthuſiaſm. See the preceding article.

ENTHYMEME, in logic and rhetoric, an argument conſiſting only of two propoſitions, an antecedent, and a conſequent deduced from it. The word is Greek, ενθυμημα, formed of the verb ενθυμεισθαι, "to think, conceive," a compound of εν and θυμος, "mind."

The enthymeme is the moſt ſimple and elegant of all argumentations; being what a man, in arguing cloſely, commonly makes, without attending at all to the form. Thus, that verſe remaining of Ovid's tragedy, intitled *Medea*, contains an enthymeme; *Servare potui, perdere an poſſum rogas:* "I was able to ſave you; conſequently to have deſtroyed you." All the beauty would

† See Eagle.

would have been loſt, had all the propoſitions been expreſſed; the mind is diſpleaſed with a rehearſal of what is no ways neceſſary.

Sometimes, alſo, the two propoſitions of an enthymeme are both included in a ſingle propoſition, which Ariſtotle calls an *enthymematical ſentence*, and gives this inſtance thereof: *Mortal, do not bear an immortal hatred.* The whole enthymeme would be, *Thou art mortal; let not, therefore, thy hatred be immortal.*

ENTITY, the ſame with Ens.

# ENTOMOLOGY;

THE ſcience of inſects, or that part of zoology which treats of inſects.

By ſome natural hiſtorians, this claſs of animals is conſidered as the moſt imperfect of any, while others prefer them to the larger animals. One mark of their imperfection is ſaid to be, that many of them can live a long time, though deprived of thoſe organs which are neceſſary to life in the higher ranks of nature. Many of them are furniſhed with lungs and an heart, like the nobler animals; yet the caterpillar continues to live, though its heart and lungs, which is often the caſe, are entirely eaten away.—It is not, however, from their conformation alone that inſects are inferior to other animals, but from their inſtincts alſo. It is true, that the ant and the bee preſent us with ſtriking inſtances of aſſiduity; yet even theſe are inferior to the marks of ſagacity diſplayed by the larger animals. A bee taken from the ſwarm is totally helpleſs and inactive, incapable of giving the ſmalleſt variations to its inſtincts. It has but one ſingle method of operating; and if put from that, it can turn to no other. In the purſuits of the hound, there is ſomething like choice; but in the labours of the bee, the whole appears like neceſſity and compulſion.—All other animals are capable of ſome degree of education; their inſtincts may be ſuppreſſed or altered; the dog may be taught to fetch and carry, the bird to whiſtle a tune, and the ſerpent to dance: but the inſect has only one invariable method of operating; no arts can turn it from its inſtincts; and indeed its life is too ſhort for inſtruction, as a ſingle ſeaſon often terminates its exiſtence.—Their amazing number is alſo an imperfection. It is a rule that obtains through all nature, that the nobler animals are ſlowly produced, and that nature acts with a kind of dignified economy; but the meaner births are laviſhed in profuſion, and thouſands are brought forth merely to ſupply the neceſſities of the more favourite part of the creation. Of all productions in nature, inſects are by far the moſt numerous. The vegetables which cover the ſurface of the earth bear no proportion to the multitudes of inſects; and though, at firſt ſight, herbs of the field ſeem to be the parts of organized nature produced in the greateſt abundance, yet, upon more minute inſpection, we find every plant ſupporting a mixture of ſcarce perceptible creatures, that fill up the compaſs of youth, vigour, and age, in the ſpace of a few days exiſtence.—In Lapland, and ſome parts of America, the inſects are ſo numerous, that if a candle is lighted they ſwarm about it in ſuch multitudes, that it is inſtantly extinguiſhed by them; and in theſe parts of the world, the miſerable inhabitants are forced to ſmear their bodies and faces with tar, or ſome other unctuous compoſition, to protect them from the ſtings of their minute enemies.

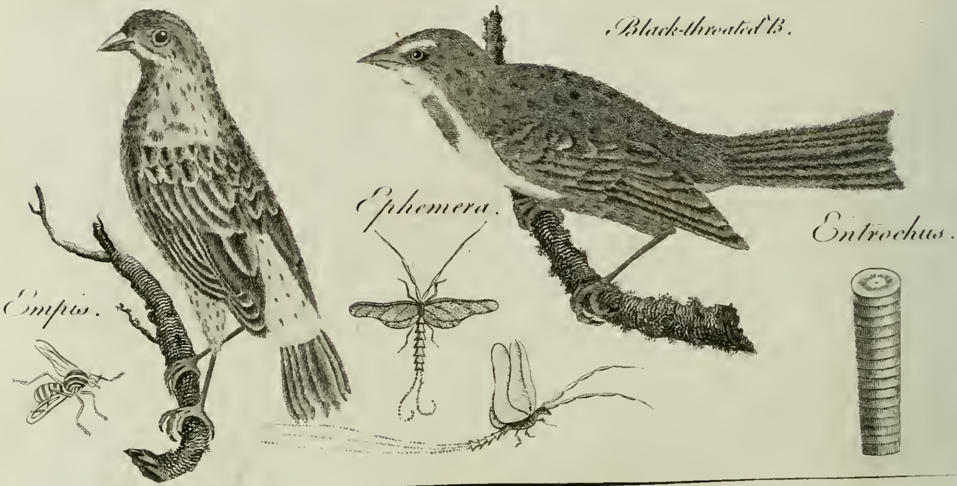
On the other hand, Swammerdam argues for the perfection of inſects in the following manner. "After an attentive examination (ſays he) of the nature and anatomy of the ſmalleſt as well as the largeſt animals, I cannot help allowing the leaſt an equal, or perhaps a ſuperior, degree of dignity. If, while we diſſect with care the larger animals, we are filled with wonder at the elegant diſpoſition of their parts, to what an height is our aſtoniſhment raiſed, when we diſcover all theſe parts arranged, in the leaſt, in the ſame regular manner! Notwithſtanding the ſmallneſs of ants, nothing hinders our preferring them to the largeſt animals, if we conſider either their unwearied diligence, their wonderful ſtrength, or their inimitable propenſity to labour. Their amazing love to their young is ſtill more unparalleled among the larger claſſes. They not only daily carry them to ſuch places as may afford them food; but if by accident they are killed, and even cut into pieces, they will with the utmoſt tenderneſs carry them away piecemeal in their arms. Who can ſhow ſuch an example among the larger animals which are dignified with the title of *perfect?* Who can find an inſtance in any other creature that can come in competition with this?"

On this diſpute it is only neceſſary to obſerve, that the wiſdom of the Creator is ſo conſpicuous in all his works, and ſuch ſurpriſing art is diſcovered in the mechaniſm of the body of every creature, that it is very difficult, if not impoſſible, to ſay where it is moſt, and where it is leaſt, to be obſerved.

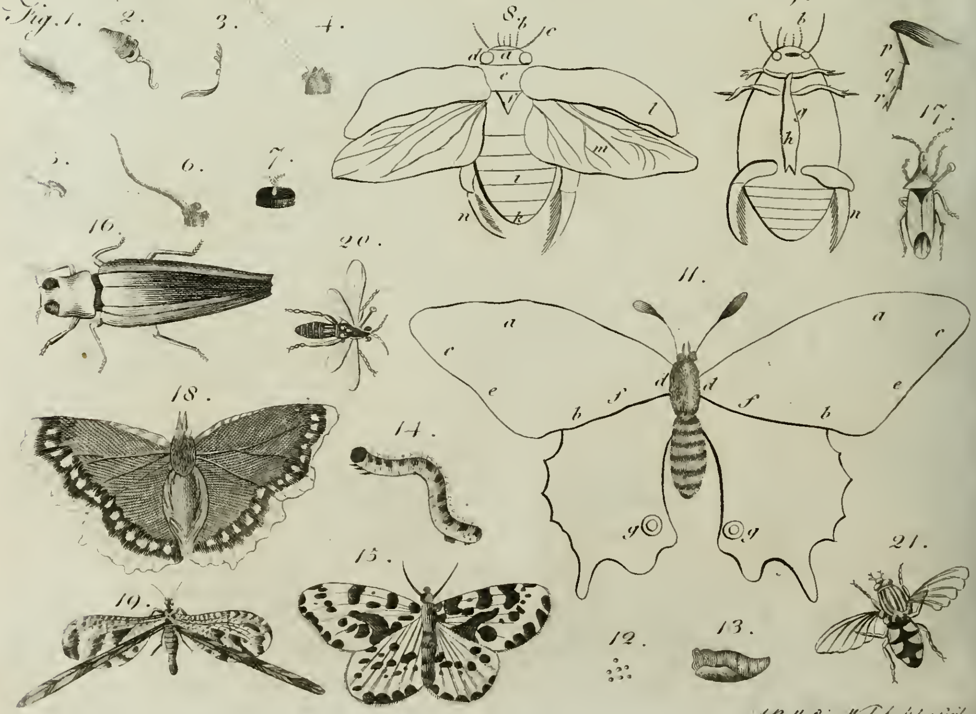
Whoever is deſirous of attaining a ſyſtematic knowledge of inſects, ought primarily to be ſolicitous about acquiring the terms made uſe of in the ſcience, that ſo he may be able rightly to denominate every part of an inſect. The ſtudent is firſt to know what an inſect is, leſt he miſtake hippocampi, and other amphibious animals, for them, as was formerly done; or confound them with the *vermes*, which Linnæus firſt diſtinguiſhed from inſects, and which differ as eſſentially from them as the claſs mammalia do from birds. Every inſect is furniſhed with a head, antennæ, and feet, of all which the vermes are deſtitute. All inſects have ſix or more feet; they reſpire through pores placed on the ſides of their bodies, and which are termed *ſpiracula:* their ſkin is extremely hard, and ſerves them inſtead of bones, of which they have internally none. From this definition, the acus marina is evidently no inſect. But the antennæ placed on the fore-part of the head, conſtitute the principal diſtinction. Theſe are jointed and moveable in every part, in which they differ from the horns of other animals: they are organs conveying ſome kind of ſenſe; but we have no more idea of what this kind of ſenſe is, than a man has, who, without eyes, attempts to determine the particular action of the rays of light on the retina of the eye, or to explain the changes which from thence take place in the human mind. That they are the organs of ſome kind

of

## Emberiza, or Bunting.



## ENTOMOLOGY.



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of ſenſe, is apparent from their perpetually moving them forward; yet the hard cruſt with which they are inveſted, and their ſhortneſs in flies and other inſects, would induce one to believe them not to be the organs of touch: Mr Barbut ſuppoſes them to conſtitute or to contain the organs of hearing. That they are tubular, and filled with air, and ſome kind of humour, appears from the antennæ of butterflies immerſed in water.—To come now to the terms of the art. A knowledge of the external parts of the body is firſt to be eſtabliſhed; which, after the method of anatomiſts, we divide into head, trunk, abdomen, and extremities.

### Sect. I. *External Parts of the Body.*

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3.

I. CAPUT, the Head. This part in inſects without brain. The difference between the brain and ſpinal marrow conſiſts in the former being a medullary part organized. We do not deny the exiſtence of a medullary thread in the heads of inſects, but we never could diſcover it to be organized: hence the hippoboſca equina, or horſe fly, will live, run, nay even copulate, after being deprived of its head; to ſay nothing of many others which are capable of living a long while in the ſame ſituation.

As they are not apparently furniſhed with ears, they have been apprehended incapable of hearing; as we can no more conceive that ſenſe to exiſt without ears than viſion without eyes. That they are nevertheleſs ſuſceptible of any ſhrill or loud noiſe, as well as fiſhes, is indiſputable; but it has been ſuppoſed to be in a manner different from that of hearing. Mr Barbut, however, ſuppoſes them to poſſeſs this ſenſe in a very diſtinct manner. Many inſects, he obſerves, are well known to be endowed with the power of uttering ſounds, ſuch as large beetles, the bee, waſp, common fly, gnat, &c. The ſphinx atropos ſqueaks, when hurt, nearly as loud as a mouſe. Now, if inſects are endowed with the power of uttering ſounds, it certainly muſt be for ſome purpoſe. As they vary their cry occaſionally, it muſt certainly be deſigned either to give notice of pleaſure or pain, or ſome affection in the creature who poſſeſſes it. "The knowledge of their ſounds (ſays our author) is undoubtedly confined to their tribe, and is a language intelligible to them only; ſaving when violence obliges the animal to exert the voice of nature in diſtreſs, craving compaſſion; then all animals underſtand the doleful cry. For inſtance, attack a bee or waſp near the hive or neſt, or a few of them: the conſequence of that aſſault will be, the animal or animals, by a different tone of voice, will expreſs his or their diſapprobation or pain; that ſound is known to the hive to be plaintive, and that their brother or brethren require their aſſiſtance; and the offending party ſeldom eſcapes with impunity. Now, if they had not the ſenſe of hearing, they could not have known the danger their brother or brethren were in by the alteration of their tone."

Organs of hearing, &c

Another proof, which he reckons ſtill more deciſive, was taken from an obſervation made by himſelf on a large ſpider in St James's Park. This creature had made a very large web on a wooden railing; and was, at the time of obſervation, on one of the rails at a conſiderable diſtance from the place where a large fly entangled itſelf. Nevertheleſs, the moment the fly was entangled, the ſpider became ſenſible of it; tho', from the ſituation of the rail, he could not poſſibly have ſeen it. In this, however, Mr Barbut might poſſibly be deceived; becauſe the ſpider was perhaps alarmed by the tremulous motion of the threads, occaſioned by the fluttering of the fly; which he might well know how to diſtinguiſh from their vibration by the wind. The organ of hearing, in our author's opinion, is ſituated in the antennæ; both from their ſituation in the part of the head moſt favourable to ſuch organs, their inward ſtructure being moveable, the ears of moſt inferior animals being ſo. He has never conſidered the antennæ as either offenſive or defenſive, but has obſerved them to be endowed with an exquiſite ſenſe of feeling; that the animal appeared to be in agony when its antennæ were pinched; and that it takes care to avoid the touching any hard ſubſtance with them roughly. "This tenderneſs in the organ of hearing (ſays he) is common to all animals; and inſects ſeem to be particularly tender in theſe parts by quickly withdrawing them from the touch."

Our author further obſerves, that the antennæ of all inſects are compoſed of joints varying in ſize, form, and number. Thoſe who are chiefly confined to live under water have their antennæ in general ſhorter than thoſe who live on land. Some who roam at large in the air, have them long and ſlender. They are all hollow, and are rendered flexible by the joints, which are very viſible in the horns of the crab and lobſter. This hollowneſs, in our author's opinion, is to receive the ſound communicated to the extremities of the antennæ by the repercuſſion of the air affected by any noiſe, and convey it, by means of the joints, from one to another, till it arrives in that leſſened degree of tone beſt ſuited to the timid nature of the animal. In this circumſtance there may be many variations in point of perfection in thoſe organs; the ſtrength, utility, and degree of power in receiving ſound being proportioned to the neceſſities of the animals, different in their nature and requiſites. In moſt animals, the entrance to the auricular organ is patulous; but in this caſe the animal would ſuffer great inconvenience from ſuch an organization, as the organ would often be clogged with dirt, &c.

It has alſo appeared dubious if they have the ſenſe of ſmell, no organ being found in them adapted to that purpoſe: and although it was evident they had a perception of agreeable and fetid effluvia, it was thought to be in a manner altogether unknown to us. Mr Barbut is of opinion that the organs of ſmell reſide in the palpi or feelers. Many inſects have four and ſome ſix, two of which are in general cheliform, in order to aſſiſt the inſect in conveying its food to its mouth. It may be likewiſe obſerved, that the palpi are in continual motion; the animal thruſting them into every kind of putrid or other matter, as a hog would do his noſe, ſmelling and ſearching after food. Inſects which apparently do not poſſeſs palpi or ſpiral tongues, have undoubtedly ſome organ concealed within the mouth analogous to them in function and utility; the fleſhy proboſcis of the fly is thruſt into every ſubſtance in which the animal expects to find food; and when it is extended, nearly in the middle are ſituated, in our author's opinion, two upright palpi, which, no

Eyes, Antennæ, &c.

doubt, perform in their turn ſome office, perhaps that of ſmell.

Many inſects have no tongue, nor make any ſound with their mouth; but for this purpoſe ſome uſe their feet, others their wings, and others ſome elaſtic inſtrument with which they are naturally furniſhed.

Eyes. Moſt inſects have two; but the gyrinus has four, the ſcorpion ſix, the ſpider eight, and the ſcolopendra three. They have no eye-brows, but the external tunic of their eyes is hard and tranſparent like a watch-glaſs; their eyes have no external motion, unleſs it be in the crab. They conſiſt for the moſt part of one lens only; but in thoſe of the butterfly, dipteræ, and many of the beetles, they are more numerous. Pugett diſcovered 17,325 lenſes in the cornea of a butterfly, and Lieuwenhoek 800 in a fly.

Antennæ. Of theſe there are in general two (unleſs four are allowed to ſome kind of crabs), and placed on the fore-part of the head: they are peculiar to inſects; and are plainly diſtinguiſhable from the tentaculæ of the vermes, in being cruſtaceous; and from the palpi of inſects, which are more numerous, placed near the mouth, and are ſometimes wanting. As the antennæ are of great moment in diſtinguiſhing the various kinds of inſects, we ſhall enumerate and explain the ſeveral different forms of them.

*Setaceæ*, are thoſe which grow gradually taper towards the extremity.

*Filiformes*, ſuch as are of the ſame thickneſs throughout.

*Moniliformes*, are filiform, like the preceding, but conſiſt of a ſeries of round knobs, like a necklace of beads.

*Clavatæ*, ſuch as gradually increaſe in ſize toward the extremity.

*Capitatæ*, are *clavatæ*, but have the extremity ſomewhat round.

*Fiſſiles*, are *capitatæ*; but have the capitulum, or knob, divided longitudinally into three or four parts, or laminæ, as in the ſcarabæi.

*Perfoliatæ*, are alſo *capitatæ*; but have the capitulum horizontally divided, as in the dermeſtes.

*Pectinatæ*, ſo called from their ſimilitude to a comb, though they more properly reſemble a feather, as in the moths and elateres. This is moſt obvious in the male.

*Ariſtatæ*, ſuch as have a lateral hair, which is either naked or furniſhed with leſſer hairs, as in the fly; *Breviores*, thoſe which are ſhorter than the body; *longiores*, thoſe which are longer than the body; *mediocres*, thoſe which are of the ſame length with the body; all three of which varieties are diſtinguiſhable in the cerambyces.

Palpi, or *Feelers*, reſemble filiform, articulated, moveable antennæ. They are moſt commonly four in number, ſometimes ſix; they are ſufficiently diſtinguiſhed from antennæ, in being naked, ſhort, and always placed at the mouth.

Os, the *Mouth*, is generally placed in the anterior part of the head, extending ſomewhat downwards. In ſome inſects, it is placed under the breaſt, as in the chermes, coccus, cancer (crab), and curculio.

Rostrum, or *Proboſcis*, is the mouth drawn out to a rigid point: in many of the hemiptera claſs it is bent downward toward the breaſt and belly, as in the cicada, nepa, notonecta, cimex (bug), aphis, and remarkably ſo in ſome curculiones.

Tongu
Legs, &

Maxillæ, the *Jaws*, are two in number, ſometimes four, and at other times more; they are placed horizontally; the inner edge of them in ſome inſects is ſerrated or furniſhed with little teeth.

Lingua, the *Tongue*, in ſome inſects is taper and ſpiral, as in the butterfly; in others it is fleſhy, reſembling a proboſcis, and tubular, as in the fly.

Labium *ſuperius*, the *upper Lip*, is ſituated above the jaws; as in the ſcarabæus and gryllus.

Stemmata, or *Crown*, are three ſmooth hemiſpheric dots, placed generally on the top of the head; as in moſt of the hymenoptera, and others.

II. TRUNCUS, the Trunk, is that part which comprehends the breaſt or thorax: it is ſituated between the head and abdomen; and has the legs inſerted into it, that its parts may be diſtinctly determined. It is divided into *thorax*, *ſcutellum*, and *ſternum*.

Thorax, the *Thorax*, is the back part of the breaſt; and is very various in its ſhape. It is called *dentatus*, when its ſides are armed with points; *ſpinoſus*, when its back is furniſhed with them, as in the cerambyx; and *marginatus*, when its margin is laterally dilated, as in the ſilpha and caſſida.

Scutellum, or *Eſcutcheon*, is the poſterior part of the thorax: it is frequently triangular; and appears to be divided from the thorax by an intervening ſuture, as in moſt of the coleoptera.

Sternum, the *Sternum*, is ſituated on the inferior part of the thorax; it is pointed behind in the elateres, and bifid in ſome of the dytiſci.

III. ABDOMEN, the Abdomen is in moſt inſects diſtinct from the thorax; it is the poſterior part of the body of the inſect; and is compoſed of a number of annular ſegments, which ſerve occaſionally to lengthen or ſhorten it, and to contain the organs of chylification, &c.

Spiracula, are little holes or pores, placed ſingly on each ſide of every ſegment of the abdomen: thro' theſe the inſect breathes; and if oil be applied ſo as to ſtop them up, it proves fatal to moſt of them.

Tergum, the *Back*, is the ſuperior part of the abdomen.

Venter, the *Belly*, is the inferior part.

Anus, is the poſterior part of the abdomen, perforated for the evacuation of the excrement. This part alſo frequently contains the organs of generation.

IV. ARTUS, the Limbs or Extremities, are the various inſtruments of motion.

Pedes, the *Legs*, are generally ſix. There is an exception to this, however, in the claſs Aptera, many of which have eight; as acari (mites), phalangii, moſt of the aranei (ſpiders), ſcorpiones (ſcorpions), and cancri (crabs). The oniſcus has 14, and the iuli and ſcolopendri ſtill more.

The firſt joint of the leg, which is generally thickeſt, is called *femur*; the ſecond, which is generally of the ſame ſize throughout, *tibia*; the third, which is jointed, is diſtinguiſhed by the name of *tarſus*; and ws, &c Inſects

the laſt, which in moſt inſects is double, by that of *unguis*. The legs of inſects, in general, are named from the various motions they produce: *Curſorii*, from that of running, which are the moſt numerous; *ſaltatorii*, from that of leaping; *natatorii*, from that of ſwimming, &c.—In the *ſaltatorii*, the thighs are remarkably large, by which means they are able to leap to a conſiderable diſtance, as in the gryllus, graſshopper, &c. In thoſe of the *Natatorii*, the feet are flat, and edged with hairs, which anſwer the purpoſe of oars in aſſiſting them to ſwim, as in the dytiſcus.—*Mutici*, are ſuch feet as have no claws. —*Chelæ*, or claws, are the fore-feet enlarged towards their extremities, each of which is furniſhed with two leſſer claws, which act like a thumb and finger; as in the crab.

Alæ, *Wings*, the inſtmruments which enable the to fly. Theſe are membranous and undivided, except in the inſtnce of the phalænæa alucitæ, in which they are in part divided. Moſt inſects have four; the diptera claſs, and the coccus, however, have two only.

The wing is divided into its ſuperior and inferior ſurfaces: its anterior part in a butterfly, is that towards the anterior margin, or next to the head; its poſterior part, that towards the anus; its exterior part, that towards the outer edge; and the interior, that next the abdomen.

They are called *plicatiles*, when they are folded at the time the inſect is at reſt, as in the waſp; oppoſite to theſe are the *planæ*, which are incapable of being folded.

*Erectæ*, ſuch as have their ſuperior ſurfaces brought in contact when the inſect is at reſt; as in the ephemera, libellula puella and virgo, and papiliones (butterflies.)

*Patentes*, which remain horizontally extended when the inſect is at reſt; as in the phalænæ geometræ, and moſt of the libellulæ.

*Incumbentes*, ſuch as cover horizontally the ſuperior part of the abdomen when the inſect is at reſt.

*Deflexæ*, are incumbentes, but not horizontally, the outer edges declining toward the ſides.

*Reverſæ*, are deflexæ, with this addition, that the edge of the inferior wings projects from under the anterior part of the ſuperior ones.

*Dentatæ*, in which the edge is ſerrated, or ſcolloped.

*Caudatæ*, in which one or more projections in the hinder wings are extended into proceſſes.

*Reticulatæ*, when the veſſels of the wings put on the appearance of network, as in the hemerobius perla; the two anterior wings generally become ſuperior, and the poſterior ones inferior, in moths, when their wings are cloſed; but the anterior wings are called *primary*, and the inferior ones *ſecondary*, in butterflies, as they cannot with propriety be called *inferior* when the wings are erect.

*Colores*, the colours, theſe are ſelf-apparent: but according to their ſeveral ſhapes, they take the different names of *punctæ*, dots; *maculæ*, ſpots; *faſciæ*, bands, which frequently run acroſs and ſometimes ſurround the edge of the wings; *ſtrigæ*, ſtreaks, which are very ſlender faſciæ; and *lineæ*, lines, which are longitudinally extended.

Wings of Inſects.

*Ocellus*, is a round ſpot, containing a leſſer ſpot of a different colour in its centre.

*Stigmata*, another term lately introduced by Linnæus, ſignifies the ſpot, or anaſtamoſis, in the middle of the wing near the anterior margin; it is conſpicuous in moſt of the hymenoptera and neuroptera, and even in the coleoptera. The ſingle or double kidney-ſhaped ſpot, ſituated in the ſame part of the anterior wings, and frequently occurring in the phalænæ paganæ, is diſtinguiſhed likewiſe by the name of *ſtigma*.

*Elytra* (in the ſingular number elytron). The upper wings, which are of a hard ſubſtance, in ſome degree reſembling leather, and which in moſt inſects are of a very hard texture, but in others flexible, are called *elytra*; their ſuperior ſurface is generally convex, their inferior one concave. When the inſect flies, they are extended; and ſhut when it reſts, cloſing together, and forming a longitudinal ſuture down the middle of the back, as in the coleoptera.

They are of various ſhapes. *Abbreviata*, when ſhorter than the abdomen. *Truncata*, when ſhorter than the abdomen, and terminating in a tranſverſe line. *Faſtigiata*, when of equal or greater length than the abdomen, and terminating in a tranſverſe line. *Serrata*, when the exterior margin towards the apex is notched or ſerrated, as in ſome of the bupreſtes. *Spinoſa*, when their ſurface is covered with ſharp points or prickles. *Scabra*, when their ſurface is ſo uneven as to grate againſt the fingers. *Striata*, when marked with ſlender longitudinal furrows. *Porcata*, when with elevated longitudinal ſulci or ridges. *Sulcata*, when theſe ridges are concave. *Hemelytra*, when the ſuperior wings are of a middle ſubſtance betwixt leather and membrane; either totally ſo, as in the grylli; or partially ſo, as in the cimices, nepæ, and notonectæ: Theſe are commonly diſtinguiſhed by the name *hemiptera*.

*Halteres*, poiſers, (a term alſo introduced by Linnæus), are little heads placed on a ſtalk or peduncle, moſt frequently under a little arched ſcale. They are found only in the claſs diptera, and appear to be nothing more than the rudiments of the hinder wings.

Cauda, the *Tail*, in moſt inſects is,

*Simplex*, ſimple, capable of being extended, and again drawn back at pleaſure. In the crab and ſcorpion, however, it is

*Elongata*, elongated, or lengthened out.

*Setacea*, briſtle-ſhaped, or taper; as in the raphidea.

*Triſeta*, conſiſting of three briſtles; as in the ephemera.

*Furcata*, being forked, as in the podura.

*Forcipata*, reſembling a pair of forceps; as in the forficula.

*Folioſa*, reſembling a leaf; as in the blatta, grylli, and ſome ſpecies of cancri.

*Teliſera*, ſuch as are armed with a dart or ſting; as in the ſcorpion and panorpa.

*Aculeus*, an inſtrument with which they wound, and at the ſame time inſtil a poiſon; with ſuch the bee, waſp, ſcorpion, &c. are furniſhed.

### Explanation *of* Plate CLXXXII.

Fig. 1. Antennæ pectinatæ, or feathered; as in the *phalænæ*, moths.

2. An-

Of the Sexes of Inſects.

2. ANTENNÆ PERFOLIATÆ, or perfoliated ; as in the *dermeſtes* and *dytiſcus*.
3. ——— FISSILES, or fiſſile, divided into laminæ at the extremity, as in the *ſcarabæi*, beetles.
4. ——— CLAVATÆ, or club-ſhaped, as in the *papilio*, butterfly.
5. ——— MONILIFORMES, like a necklace of beads ; as in the *chryſomela*.
6. ——— SETACEÆ, ſetaceous, or briſtle ſhaped ; as in many of the *phalænæ*.
7. ——— ARISTATÆ, furniſhed with a lateral hair, as in the *fly*.
8. 9 *a* Caput, the head.
  *b* Palpi, or feelers.
  *c* Antennæ, or horns.
  *d* Oculi, the eyes.
  *e* Thorax.
  *f* Scutellum, or eſcutcheon.
  *g* Pectus, or breaſt.
  *h* Sternum, or breaſt-bone.
  *i* Abdomen, and its ſegments.
  *k* Anus.
  *l* Elytra, or ſhells.
  *m* Membranous wings.
  *n* Pedes, or feet, which are natatorii.
10. *o* Femur, or thigh.
  *p* Tibia, or leg.
  *q* Tarſus, or foot.
  *r* Unguis, or claw.
11. *a* The anterior part of the wing.
  *b* The poſterior part.
  *c* The exterior part.
  *d* The interior part.
  *e* The margin.
  *f* The diſk, or middle.
  *g* Oculus, or eye.
12, 13, 14, 15, Repreſent the inſect in its egg, caterpillar, pupa, and perfect ſtate.

## SECT. II. *Of the Sexes of Inſects.*

THE ſame difference of ſex exiſts in inſects as in other animals, and they even appear more diſpoſed to increaſe their ſpecies than other animals ; many of them, when become perfect, ſeeming to be created for no other purpoſe but to propagate their ſpecies. Thus the ſilk-worm, when it arrives at its perfect or moth-ſtate, is incapable of eating, and can hardly fly : it endeavours only to propagate its ſpecies ; after which the male immediately dies, and the female as ſoon as ſhe has depoſited her eggs.

In many inſects, the male and female are with difficulty diſtinguiſhed ; and in ſome they differ ſo widely, that an unſkilful perſon might eaſily take the male and female of the ſame inſect for different ſpecies ; as for inſtance, in the phalæna humuli, piniaria, ruſſula ; each ſex of which differs in colour. This unlikeneſs is ſtill more apparent in ſome inſects, in which the male has wings and the female none ; as in the coccus, lampyris, phalæna antiqua, brumata, lichenella. And as moſt inſects remain a long while in copulation, as we may ſee in the tipula and ſilk-worm, the winged males fly with the wingleſs females, and carry them about from one place to another; as in the phalæna antiqua. It is, however, no certain rule, that when one inſect of the ſame ſpecies is found to have wings, and the other to be without, the former muſt neceſſarily be the male, and the latter the female. The aphides, for inſtance, are an exception ; and beſides theſe, individuals of both ſexes, and of the ſame ſpecies, are found without wings, as the carabi majores, tenebriones, meloes, cimices. The gryllus pedeſtris is likewiſe deſtitute of wings ; and might have paſſed for a gryllus in its pupa ſtate, had it not been ſeen in copulation ; for it is well known that no inſect can propagate its ſpecies till it arrives at its laſt or perfect ſtate.

Propa tion, &

“ Pleraque inſectorum genitalia ſua intra anum habent abſcondita, et penes ſolitarios, ſed nonnulla penem habent bifidum : Cancri autem et Aranei geminos, quemadmodum nonnulla amphibia, et quod mirandum in loco alieno, ut Cancer, ſub baſi caudæ. *Araneus mas* palpos habet clavatos, qui penes ſunt, juxta os utrinque unicum, quæ clavæ ſexum nec ſpeciem diſtinguunt ; et fœmina vulvas ſuas habet in abdomine juxta pectus. Heic vero ſi unquam vere dixeris, “ *Res plena timoris amor :* ſi enim procus in auſpicato acceſſerit, fœmina ipſum devorat ; quod etiam fit, ſi non ſtatim ſe retraxerit. Libellula fœmina genitale ſuum ſub apice gerit caudæ, et mas ſub pectore ; adeo ut cum mas collum fœminæ forcipe caudæ arripit, illa caudam ſub pectore ejus adplicit, ſicque peculiari ratione connexæ volitent.”

Beſides thoſe of the male and female, a third ſex exiſts in ſome inſects which we call *neuter :* As theſe have not the diſtinguiſhing parts of either ſex, they may be conſidered as eunuchs or infertile.

We know of no inſtance of this kind in any other claſs of animals, nor in vegetables, except in the claſs Syngeneſiæ, and in the Opulus. This kind of ſex is only found among thoſe inſects which form themſelves into ſocieties, as bees, waſps, and ants : and here theſe kind of eunuchs are real ſlaves, as on them lies the whole buſineſs of the economy; while thoſe of the other ſex are idle, only employing themſelves in the increaſe of the family. Each family of *Bees* has one female only (called the *queen*), many males, and an almoſt innumerable quantity of neuters. Of thoſe, the neuters (whoſe antennæ have 11 joints) do the working part ; they extract and collect honey and wax, build up the cells, keep watch, and do a variety of other things. The males, whoſe antennæ conſiſt of 15 joints, do no work ; they ſerve the female once, and that at the expence of their lives ; they may be conſidered in the light of a ſet of paraſites, or ceciſbei ; but as ſoon as their buſineſs of impregnation is over, they are expelled by their ſervants the neuters, who now ſhake off the yoke, but yet pay all due reſpect to their common mother the queen. The ſame economy nearly takes place in *Waſps*, where the young females, which are impregnated in the autumn, live through the winter, and in the ſpring propagate their ſpecies; but the queen, together with all the males, periſh in the winter. Among *Ants*, the neuters form a hill in the ſhape of a cone, that the water may run off it, and place thoſe which are in the pupa ſtate on that ſide of it which is leaſt expoſed to the heat of the ſun. At a conſiderable diſtance from theſe are found the habitations of the males and females, to whom the moſt ready obedience is yielded by the neuters, till a new offſpring ſucnges of nſects.

ſucceeds, and then they oblige them to quit their habitations. But thoſe ants which live entirely under ground, provide better for themſelves in this reſpect: for a little before their nuptials, they quit their habitation of their own accord, and after ſwarming in the manner of bees, they copulate in the air; and each retiring to ſome new habitation, founds a new family.

No *hermaphrodites* have as yet been diſcovered among inſects. There is ſomething very ſingular, however, in the propagation of the aphides. A female aphis once impregnated, can produce young, which will continue to produce others without any freſh impregnation, even to the fifth progeny; afterwards a new impregnation muſt take place. See APHIS.

The male inſects, like male hawks, are always ſmaller than the females.

In the propagation of their ſpecies they are remarkably careful; ſo that it is with the greateſt difficulty the flies are kept from depoſiting their eggs on freſh meat, the cabbage butterfly from laying them on cabbage, and other inſects from depoſiting them in the ſeveral places peculiar to each. The ſcarabæus pilularius and carnifex, are deſerving of our attention, as they afford a mutual aſſiſtance to each other: for when the female has laid her eggs in a little ball of dung, the males with their feet, which are axiform, aſſiſt the female to roll it to ſome ſuitable place; as Ariſtotle and Pliny formerly, and Loefling has lately, obſerved.

It is very wonderful to obſerve, that in the coccus and oniſcus, the female has no ſooner brought forth her young, than ſhe is devoured by it; and that the ſphex ſhould be able ſo readily to kill the caterpillar of a moth, then bury it in the earth, and there depoſit her eggs in it. Nor can we without admiration behold the ſame ſpecies of aphis, which was viviparous in the ſummer, become oviparous in the autumn.

Almoſt innumerable examples might be brought of the ſingularities in the eggs of inſects: we ſhall, however, only mention thoſe of the hemerobius, which are depoſited on a footſtalk; thoſe of the phalæna neuſtria, which are placed regularly in a ring round the branch of ſome tree; and the compound eggs of the blatta.

## SECT. III. *Metamorphoſes of Inſects.*

THERE are no inſects, except thoſe of the aptera claſs, but what are continually undergoing ſome tranſformation. Inſects change firſt from the (ovum) egg, into the (larva) caterpillar or maggot; then into the (pupa) chryſalis; and laſtly into the (imago) fly or perfect ſtate. During each of thoſe changes, their appearance differs as much as night and day.

The inſect, as ſoon as it came out of the egg, was by former entomologiſts called *eruca*; but as this is ſynonymous with the botanic name *ſiſymbrium*, it was changed by Linnæus for the term

*Larva*; a name expreſſive of the inſect's being, in this ſtate, as it were maſked, having its true appearance concealed. Under this maſk or ſkin the entire inſect, ſuch as it afterwards appears when perfect, lies concealed, inveloped only in its tender wings, and putting on a ſoft and pulpy appearance; inſomuch that Swammerdam was able to demonſtrate the butterfly with its wings to exiſt in a caterpillar, though it bore but a faint reſemblance to its future perfection. The inſect, therefore, in this ſtate, undergoes no other alteration but the change of its ſkin. The larvæ are, for the moſt part, larger than the inſect, when perfect, and are very voracious. The caterpillar of the cabbage-butterfly eats double what it would ſeem to require from its ſize; but its growth is not adequate to its voracity.

Changes of Inſects.

*Pupa*. The inſect in this ſtate was formerly called *chryſalis*, or *aurelia*; but as the appearance of gilding is confined to a few butterflies only, the term of *pupa* has been adopted in its ſtead; becauſe the lepidoptera, eſpecially, reſemble an infant in ſwaddling clothes; and in this ſtate all, except thoſe of the hemiptera claſs, take no nouriſhment.

*Imago*, is the third ſtate. This name is given by Linnæus to this third change, in which the inſect appears in its proper ſhape and colours; and as it undergoes no more transformations, it is called *perfect*. In this ſtate it flies, is capable of propagating its ſpecies, and receives true antennæ; which before, in moſt inſects, were ſcarce apparent.

As the ſhape of the pupa is different in different claſſes of inſects, it aſſumes different names; thus it is called

*Coarctata*, when it is round, and as it were turned, without the leaſt reſemblance of the ſtructure of the inſect; as in the diptera.

*Obtecta*, when it conſiſts as it were of two parts, one of which ſurrounds the head and thorax, and the other the abdomen.

*Incompleta*, when they have wings and feet, but are not capable of moving them; as in moſt of the hymenoptera.

*Semicompleta*, in which they walk or run, but have only the rudiments of wings.

*Completa*, in which they immediately obtain the perfect form of the inſect, without undergoing any more change: as in thoſe of the aptera claſs, except only the flea. The bed-bug alſo belongs to this claſs.

The ſpider undergoes frequent tranſformations, though only in the colour of its ſkin. The cruſtaceous inſects, as crabs, lobſters, &c. yearly caſt their ſhells, as their growth would otherwiſe be impeded.

The ſcolopendri, when young, have fewer feet than when they are full grown.

All inſects, as ſoon as they undergo the third change, are arrived at their full growth; nor do we find any difference in the ſize of the ſame ſpecies of inſect in the ſame countries, unleſs, during its caterpillar ſtate, it has not had a ſufficiency of proper food.

## SECT IV. *Claſſification of Inſects.*

As inſects are endowed with the various powers of creeping, flying, and ſwimming, there is ſcarce any place, however remote and obſcure, in which they are not to be found. The great confuſion which appeared to the ancients to ariſe from their number, made them never dream of reducing them to any ſyſtem. Swammerdam, that indefatigable inquirer into nature, obſerved that their metamorphoſes were divided by nature into ſeveral ſtates or orders. Their external appearance alſo carried with it ſome mark of diſtinction: ſo that entomologiſts called all thoſe of the coleoptera

Claſſification of Inſects.

claſs *Scarabæi* (beetles); thoſe of the lepidoptera *Papiliones;* and thoſe of the gymnoptera claſs that had two wings only, *Muſcæ* (flies); thoſe of the ſame claſs that had four wings, were called *Apes* (bees). No farther progreſs was made in the ſyſtematic part of this ſcience till the time of Linnæus. He was the firſt that undertook to determine the genera, and aſſign them their proper characters, in the *Syſtema Naturæ;* and thus reduced this ſcience to a ſyſtematic form. This ſyſtem, in ſubſequent editions, was conſiderably enriched and amended by him, inſomuch that the ſcience of inſects now ſhines forth in its full luſtre. He it was who firſt inſtituted natural orders, and reduced them into genera by expreſſive names; determined an infinite number of ſpecies in the *Fauna Suecica* and *Muſeum Reginæ;* collected with incredible pains the ſynonymous names of the various authors who had written on them; and laſtly, added their deſcriptions, and the places in which they were to be found. So that the ſyſtem of this illuſtrious author will lead any perſon, without the aſſiſtance of a maſter, for the moſt part, eaſily to aſcertain the name of any inſect he may meet with. Before his time ſcarce any more than 200 inſects were known; whereas, in the laſt edition of his ſyſtem, he has determined the names of nearly 3000 diſtinct ſpecies; though this is not the ſixth part of the number that is now known.

Orders. The claſs of *inſects* is divided by Linnæus into ſeven orders.

Plate CLXXXII. 1. The *Coleoptera* (from κωλεος *a ſheath*, and πτερον *a wing*), are ſuch inſects as have cruſtaceous elytra or ſhells, which ſhut together, and form a longitudinal ſuture down the back of the inſect; as the beetle (*bupreſtris ignita*), fig. 16.

2. *Hemiptera* (from ημισυ *half*, and πτερον *a wing*), have their upper wings uſually half cruſtaceous and half membranaceous, not divided by a longitudinal ſuture, but incumbent on each other; as the cimex, fig. 17.

3. *Lepidoptera* (from λεπις *a ſcale*, and πτερον *a wing*), are inſects having four wings, covered with fine ſcales in the form of powder or meal; as in the butterfly (*papilio antiopa*,) fig. 18.

4. *Neuroptera*, from νευρον *a nerve*, and πτερον *a wing*,) have four membranous tranſparent naked wings, generally like network; as in the *panorpa coa*, fig. 19.

5. *Hymenoptera* (from υμην *a membrane*, and πτερον *a wing*), are inſects with four membranous wings, tail furniſhed with a ſting; as in the *tenthredo*, fig. 20.

6. *Diptera* (from δυω *two*, and πτερον *a wing*), are ſuch as have only two wings, and poiſers; as in the fly (*muſca*), fig. 21.

7. *Aptera* (from α *without*, and πτερον *a wing*), inſects having no wings This laſt diviſion contains ſcorpions, ſpiders, crabs, lobſters, &c. See Aranea, Cancer, &c.

Genera. To inſert here the characters of all the different genera which may be found in Linnæus's Syſt. Nat. would be unneceſſary. It will be ſufficient to enumerate ſome new genera mentioned by ſubſequent ſyſtematic writers, that, by being acquainted with the ſubtile diſtinctions on which they are built, the ſtudent may avoid running into confuſion. It is among the moderns only that genera of this kind are to be met with, and new names given them. To remove this difficulty, we ſhall firſt enumerate the names of thoſe authors which are ſynonymous with thoſe of Linnæus.

*New* Genera *of authors ſynonymous with thoſe of Linnæus.*

| *Linnæus's Names.* | Names of other Authors. |
|---|---|
| Lucanus | *Platyceros* |
| Hiſter | *Attelabus* |
| Byrrhus | *Anthrenus ciſtela* |
| Mylabris | *Laria* Scop. |
| Attelabus | *Clerus* |
| Silpha | *Peltis* |
| Bruchus | *Mylabris* |
| Ptinus | *Byrrhus* |
| Chryſomela | *Galericula* |
| Hiſpa | *Crioſeris* |
| Cantharis | *Cicindela* |
| Bupreſtis | *Cucujus* |
| Carabus | *Bupreſtis* |
| Myrmeleon | *Formica-leo* |
| Sirex | *Uroceros.* |

*New genera of authors.*

*Copris.* Scarabæus abſque ſcutello
*Boſtricius.* Dermeſtes capecinus
*Ciſtela.* Byrrhus pilula
*Rhinomancer.* Attelabus roſtro producto fere curculionis.
*Anthribus.* Silpha
*Bruchus.* Ptinus Fur ob ſpinas thoracis
*Melolontha.* Chryſomela cylindrica
*Altica.* —— ſaltatoria
*Diaperis.* —— fungorum
*Pyrochora.* Cantharis
*Telephorus.* Cantharis
*Cantharis.* Meloë alata
*Cerocoma.* Meloë ſhafferi
*Notaxis.* Meloë monoceros
*Prionus.* Cerambyx thoracis margine denticulato
*Stenocoris.* Leptura thorace ſpinoſa
*Hydrophilus.* Dytiſcus antennis clavatis
*Mylabris.* Necydalis minor
*Acridium.* Gryllus muticus
*Locuſta.* —— tettigonia
*Tettigonia.* Cicada
*Corixa.* Notonecta
*Naucoceris.* Nepa
*Perla.* Hemerobius cauda biſecta
*Libelluloides.* Myrmeleon antennis capitatis
*Crabro.* Tenthredo antennis clavatis
*Pterophorus.* Phalæna alucita
*Bibio.* Tipula thorace ſpinoſo
*Stomoxoides.* Aſilus bucca inflata
*Strationymus.* Muſca
*Nemotelus.* Muſca.
*Volucella.* Muſca.

Claſſific tion of I ſects.

Theſe genera appear to be in a great meaſure like thoſe which were introduced into botany by the followers of Rivinus. Paying too little regard to nature, they disunited natural genera, on account of the moſt trifling diſtinctions. This made their continuance in the ſcience of very ſhort duration; our buſineſs here is not to ſuppoſe, but to examine, what nature will allow of, and what ſhe will not. Knowledge of this kind, built on opinion only, will not ſtand. We are therefore to look into the ſcience with great accuracy; and the larva of the inſect, its manner of changing, and other ifica- of In-

Claſſification of Inſects.

other things of moment, are to be known, before we preſume to form a new genus.

Coining of new names, and changing of one old one for another, has been the ſource of the greateſt confuſion. Thus, in order to reduce the cicindela and carabus to the ſame genus, *bupreſtis* has been adopted for the generic name; but as that genus had long ago received a very different application, it was changed for that of *cucujus*.

Again, that the officinal cantharides might be ranged among the cerambyces, the cantharides have been removed from the genus of meloë (to which they naturally belong), and referred to the genus of cicindela, obtaining thus a new name. And ſo of many others.

Thus alſo, to mention no more, how needleſs and raſh was it to ſeparate the acridium and locuſta from the genus of gryllus, the crabro from the tenthredines, and the mylabris from the necydalis!

TRIVIAL NAMES. The trivial names placed under their reſpective genera will occaſion little or no controverſy; they are current like money, and of the ſame utility as the proper names of men, Peter or Paul, &c. Inſects living on vegetables ſhould receive their names from the particular plants on which they moſtly feed, as they are preferable to all others. Thus the names of the *phalæna mori*, &c. are excellent; and when we are able to give ſuch to inſects, the old ones are to be diſcarded. But we are to be cautious of not being too haſty in our judgment in this reſpect; as inſects, when they cannot get their favourite food, will often eat other plants. Thus the ſilk-worm, for want of mulberry leaves, will eat thoſe of lettuce, though it will not thrive ſo well on them.

Many other inſtances of the invention of trivial names will be met with in the *Syſtema Naturæ*, particularly among the butterflies and moths. To prevent confuſion from the great number of ſpecies which conſtitute the genus of phalæna, they are diſtributed into ſections, and diſtinguiſhed by the terms of *bombyces*, *noctuæ*, *geometræ*, *tortrices*, *pyralides*, *tineæ*, and *alucitæ*. The bombyces and noctuæ, which are ſo much alike, that the females of the bombyces are with great difficulty diſtinguiſhed from the noctuæ, are named promiſcuouſly.

All thoſe of the geometræ have their names terminating in *aria* and *ata*, according as their antennæ are ſetaceous or pectinated. The tortrices, in *aria*; the pyralides, in *alis*; the tineæ, in *ella*; and the alucitæ, in *dactyla*: ſo that it is evident from the termination itſelf to what ſection the inſect is to be referred.

It were to be wiſhed that ſimilar inſtitutions could be formed throughout the whole ſcience, as here the name itſelf ſerves to diſtinguiſh the inſect.

Butterflies are divided into ſections, by the names of *Equites*, *Heliconii*, *Danai*, *Nymphales*, and *Plebeii*.

In ſuch a multitude of butterflies, the greateſt part of which are foreign and extra European, and to whoſe food and manner of life we are utter ſtrangers, it was impoſſible to give ſignificant trivial names. Linnæus, therefore, by way of ſimile, has taken the names of the *Equites* from the Trojan hiſtory. Theſe conſiſt, as it were, of two troops or bodies; of which one contains the ſable, and as it were mourning nobles, having red or bloody ſpots at the baſis of their wings. Theſe receive names from the Trojan nobles; and as Priam was king of Troy, the moſt ſplendid among theſe bear his name. The other body, ornamented with a variety of gay colours, are diſtinguiſhed by the names of the Grecian heroes; and as in both armies there were kings as well as officers of an inferior rank, thoſe elegant butterflies, whoſe hinder wings reſembled tails, were diſtinguiſhed by ſome royal name. Thus when Paris is mentioned (knowing from hiſtory that he was a Trojan, and of royal blood), we find him among thoſe of the firſt ſection; that is, thoſe of a ſable colour, ſpotted in the breaſt with red, and having their hinder-wings reſembling tails. When Agamemnon is named, we remember him to be a noble Greek, and find him among thoſe nobles which have variegated and ſwallow-tailed wings. But when Nereus is ſpoken of, we readily know him to belong to the laſt ſection, with wings having no tails.

The ſecond claſs, which contains the *Heliconii*, derive their names from the muſes, as Urania. The names of the ſons and daughters of Danaus are beſtowed on the third ſection. And as theſe ſpecies are ſubdivided into two other ſections, viz. the white and parti-coloured, the metaphor is ſo conducted, that the white ones preſerve the names of the daughters of Danaus, and the parti-coloured ones thoſe of the ſons of Egyptus: ſo that it is evident from the name itſelf to what ſection the butterfly is to be referred.

The names of the fourth ſection, *Nymphales*, are taken from various nymphs of antiquity; and thoſe of the fifth ſection, *Plebeii*, are ſelected from different men among the ancients whoſe names are worthy of remembrance: ſo that by this means a knowledge of the ancients may be interſperſed, and this agreeable ſcience be made doubly pleaſing.

Thoſe, therefore, who ſhall find new lepidoptera, and give them new names, will do well to follow this method, unleſs it be apparent what food the inſect chiefly ſubſiſts on.

trepas, tring.

ENTREPAS, in the manege, a broken pace or going, that is neither walk nor trot, but has ſomewhat of an amble.

This is a pace or gait of ſuch horſes as have no reins or back, and go upon their ſhoulders; or, of ſuch as are ſpoiled in their limbs.

ENTRING-LADDERS, in a ſhip, are of two ſorts; one uſed by the veſſel's ſides, in a harbour, or in fair weather, for perſons to go in and out of the ſhip: the other is made of ropes, with ſmall ſtaves for ſteps; and is hung out of the gallery to enter into the boat, or to come aboard the ſhip, when the ſea runs ſo high that they durſt not bring the boat to the ſhip's ſide for fear of ſtaving it.

Entrochus.

ENTROCHUS, in natural hiſtory, a genus of extraneous foſſils, uſually of about an inch in length, and made up of a number of round joints, which, when ſeparate and looſe, are called *trochitæ*: they are compoſed of the ſame kind of plated ſpar with the foſſil ſhells of the echini, which is uſually of a bluiſh-grey colour, and

and very bright where freſh-broken; they are all ſtriated from the centre to the circumference, and have a cavity in the middle. See Plate CLXXXII.

The entrochi are found of all ſizes, from that of a pin's head to a finger's length, and the thickneſs of one's middle finger; and are plainly of marine origin, having often ſea-ſhells adhering to them. They ſeem to be the petrified arms of that ſingular ſpecies of the ſea ſtar-fiſh, called *ſtella arboreſcens*.

They are eſteemed very powerful diuretics, and preſcribed in nephritic caſes with good ſucceſs; the doſe being as much of the powder as will lie on a ſhilling.

ENTRY, in law, ſignifies taking poſſeſſion of lands or tenements, where a perſon has a right ſo do.

*Entry of an Heir*, in Scots law, that form of law by which an heir veſts in himſelf a proper title to his predeceſſor's eſtate.

*Bill of Entry*, in commerce. See Bill.

In making entries inwards, it is uſual for merchants to include all the goods they have on board the ſame ſhip in one bill, though ſometimes they may happen to be upwards of 20 ſeveral kinds: and in caſe the goods are ſhort entered, additional or poſt entries are now allowed; though formerly the goods, ſo entered, were forfeited. As to bills of entry outwards, or including goods to be exported, upon delivering them, and paying the cuſtoms, you will receive a ſmall piece of parchment called a *cocket*, which teſtifies your payment thereof, and all duties for ſuch goods.

If ſeveral ſorts of goods are exported at once, of which ſome are free, and others pay cuſtoms; the exporter muſt have two cockets, and therefore muſt make two entries; one for the goods that pay, and the other for the goods that do not pay cuſtom.

Entries of goods, on which a drawback is allowed, muſt likewiſe contain the name of the ſhip in which the goods were imported, the importer's name, and time of entry inwards. The entry being thus made, and an oath taken that the cuſtoms for thoſe goods were paid as the law directs, you muſt carry it to the collector and comptroller, or their deputies; who, after examining their books, will grant warrant, which muſt be given to the ſurveyor, ſearcher, or land-waiter, for them to certify the quantity of goods; after which the certificate muſt be brought back to the collector and comptroller, or their deputies, and oath made that the ſaid goods are really ſhipped, and not landed again in any part of Great Britain.

ENVELOPE, in fortification, a work of earth, ſometimes in form of a ſimple parapet, and at others like a ſmall rampart with a parapet: it is raiſed ſometimes on the ditch, and ſometimes beyond it.

ENVIRONNE', in heraldry, ſignifies ſurrounded with other things: thus, they ſay, a lion enveronné with ſo many bezants. See Bezant.

ENUMERATION, an account of ſeveral things, in which mention is made of every particular article.

Enumeration, in rhetoric, a part of peroration; in which the orator, collecting the ſcattered heads of what has been delivered throughout the whole, makes a brief and artful relation or recapitulation thereof.

ENVOY, a perſon deputed to negociate ſome affair with any foreign prince or ſtate. Thoſe ſent from the courts of Britain, France, Spain, &c. to any petty prince or ſtate, ſuch as the princes of Germany, the republics of Venice, Genoa, &c. go in quality of envoys, not ambaſſadors; and ſuch a character only do thoſe perſons bear, who go from any of the principal courts of Europe to another, when the affair they go upon is not very ſolemn or important. There are envoys ordinary and extraordinary, as well as ambaſſadors; they are equally under the protection of the law of nations, and enjoy all the privileges of ambaſſadors; only differing from them in this, that the ſame ceremonies are not performed to them.

ENVY, in ethics; pain felt, and malignity conceived, at the ſight of excellence or happineſs in another. See Emulation.

EON, or Æon. See Æon.

EONIANS, in church hiſtory, the followers of Eon, a wild fanatic of the province of Bretagne, in the 12th century, whoſe brain was diſordered. He concluded from the reſemblance between *eum*, in the form for exerciſing malignant ſpirits, viz. *Per eum, qui venturus eſt judicare vivos & mortuos*, and his own name Eon, that he was the ſon of God, and ordained to judge the quick and dead. Eon, however, was ſolemnly condemned by the council at Rheims in 1148, at which Pope Eugenius III. preſided, and ended his days in a miſerable priſon. He left behind him a number of followers and adherents, whom perſecution and death ſo weakly and cruelly employed, could not perſuade to abandon his cauſe, or to renounce an abſurdity which, ſays Moſheim, one would think could never have gained credit but in ſuch a place as Bedlam.

EORIA, in mythology, a feaſt celebrated by the Athenians in honour of Erigonus, who, by way of puniſhment, for their not avenging the death of his father Icarus, engaged the gods to inflict the curſe on their daughters, that they ſhould love men who never returned their paſſion. The feaſt was inſtituted by the order of Apollo.

EOSTRE, in mythology, a Saxon goddeſs to whom they ſacrificed in the month of April, called the month of *Eoſtra*; and thence the name *Eaſter*, which the Saxons retained after their converſion to Chriſtianity, applying it to the feſtival celebrated in commemoration of our Saviour's reſurrection.

EPACRIS, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants. The calyx is a five-parted perianthium; the corolla monopetalous and tubular; the ſtamina five very ſhort filaments; the pericarpium a roundiſh, depreſſed, quinquelocular, quinquevalvular, gaping capſule; the ſeeds are numerous and very ſmall.

EPACTS, in chronology, the exceſſes of the ſolar month above the lunar ſynodical month, and of the ſolar year above the lunar year of twelve ſynodical months; or of ſeveral ſolar months above as many ſynodical months, and ſeveral ſolar years above as many dozen of ſynodical months.

The epacts, then, are either *annual* or *menſtrual*.

Menſtrual epacts are the exceſſes of the civil or kalendar month above the lunar month. Suppoſe, *e. gr.* it were new-moon on the firſt day of January; ſince the lunar month is 29 days 12 h. 44 3″, and the month of January contains 31 days, the menſtrual epact is 1 day 11 h. 15′ 57″.

Annual epacts are the exceſſes of the ſolar year above the lunar. Hence, as the Julian ſolar year is 365 days 6 h. and the Julian lunar year 354 days 8 h.

48′ 38″, the annual epact will be 10 days 21 h. 11′ 22″; that is, nearly 11 days. Conſequently the epact of 2 years is 22 days; of 3 years, 33 days; or rather 3, ſince 30 days make an *emboliſmic* or intercalary mouth.

Thus the epact of 4 years is 14 days, and ſo of the reſt; and thus, every 19th year, the epact becomes 30 or 0; conſequently the 20th year the epact is 11 again; and ſo the cycle of epacts expires with the golden number, or lunar cycle of 19 years, and begins with the ſame, as in the following table:

| Gold. Numb. | Epacts. | Gold. Numb. | Epacts. | Gold. Numb. | Epacts. |
|---|---|---|---|---|---|
| 1 | XI | 7 | XVII | 13 | XXIII |
| 2 | XXII | 8 | XXVIII | 14 | IV |
| 3 | III | 9 | IX | 15 | XV |
| 4 | XIV | 10 | XX | 16 | XXVI |
| 5 | XXV | 11 | I | 17 | VIII |
| 6 | VI | 12 | XII | 18 | XIX |
|  |  |  |  | 19 | XXX |

Again, as the new moons are the ſame, that is, as they fall on the ſame day every 19 years, ſo the difference between the lunar and ſolar years is the ſame every 19 years. And becauſe the ſaid difference is always to be added to the lunar year, in order to adjuſt or make it equal to the ſolar year; hence the ſaid difference reſpectively belonging to each year of the moon's cycle is called the *epact of the ſaid year*, that is, the number to be added to the ſaid year, to make it equal to the ſolar year; the word being formed from the Greek επαγω, *induco*, *intercalo*.

Upon this mutual reſpect between the cycle of the moon and the cycle of the epacts, is founded this rule for finding the Julian epact, belonging to any year of the moon's cycle. Multiply the year given of the moon's cycle into 11; and if the product be leſs than 30, it is the epact ſought; if the product be greater than 30, divide it by 30, and the remainder of the dividend is the epact. For inſtance, I would know the epact for the year 1712, which is the third year of the moon's cycle. Wherefore 3 is the epact for 1712; for 11×3=33, and 33 being divided by 30, there is left 3 of the dividend for the epact. But the difference of the Julian and Gregorian years being equal to the exceſs of the ſolar above the lunar year, or 11 days, it happens that the Gregorian epact for one year is the ſame with the Julian epact for the preceding year.

EPAMINONDAS, a celebrated Theban, the ſon of Polymnus, and one of the greateſt captains of antiquity. He learned philoſophy and muſic under Lyſis, a Pythagorean philoſopher; and was from his infancy inured to all the exerciſes of body and mind. He was learned, generous, well-ſkilled in war, brave, modeſt, and prudent; and had ſuch a regard for truth, that he would not tell a falſehood even in jeſt. He ſerved firſt under the Lacedemonians; ſaved the life of Pelopidas their chief, who received in a battle ſeven or eight wounds; and contracted a ſtrict friendſhip with that general, which laſted till his death. At his perſuaſions, Pelopidas delivered the city of Thebes from the yoke of the Spartans, who had rendered themſelves maſters of Cadmea, which occaſioned a bloody war between the two nations. Epaminondas was made general of the Thebans; on which he gained the celebrated battle of Leuctra, in which Cleombrotus, the valiant king of Sparta, was killed. He then ravaged the enemy's country, and cauſed the city of Meſſina to be rebuilt and peopled. At length, the command of the army was given to another, becauſe Epaminondas had kept his troops in the field four months longer than he had been ordered by the people; but, inſtead of retiring in diſguſt, he now ſerved as a common ſoldier, and diſtinguiſhed himſelf by ſo many brave actions, that the Thebans, aſhamed of having deprived him of the command, reſtored him to his poſt, in order to carry the war into Theſſaly, where his arms were always victorious. A war breaking out between the Elians and the inhabitants of Mantinea, the Thebans took the part of the former. Epaminondas then reſolved to endeavour to ſurpriſe Sparta and Mantinea; but not ſucceeding, he gave the enemy battle, in which he received a mortal wound with a javelin, the bearded iron remaining in the wound. Knowing that it could not be drawn out without occaſioning immediate death, he would not ſuffer it to be touched, but continued to give his orders: and on his being told, that the enemy were entirely defeated, "I have lived long enough (he cried), ſince I die without being conquered;" and at the ſame time he plucked the javelin from his wound, and expired, 363 B. C.

EPANALEPSIS. See ORATORY. n° 73.

EPANODOS. *Ibid.* n° 75.

EPANORTHOSIS. *Ibid.* n° 86.

EPARER, in the manege, ſignifies the flinging of a horſe, or his yerking and ſtriking with his hind-legs.

EPAULEMENT, in fortification, a work raiſed to cover ſidewiſe, is either of earth, gabions, or faſcines loaded with earth. The epaulements of the places of arms for the cavalry, at the entrance of the trenches, are generally of faſcines mixed with earth.

EPAULETTES, are a kind of ſhoulder-knots choſen for the ſoldiers, which are to be of the colour of the facing, with a narrow yellow or white tape round it, and worſted fringe: thoſe for the officers are made of gold or ſilver lace, with a rich fringe; they are badges of diſtinction worn on one or both ſhoulders. Thoſe of the dragoon-guards, horſe, and dragoons, are worn on the left ſhoulder: the light dragoons, and officers of grenadiers, have one on each ſhoulder: thoſe of the battalion wear one on the right ſhoulder only, which is to be made of embroidery or lace with a gold or ſilver fringe. Thoſe of the royal regiment of artillery are to be gold and embroidery, with gold fringe on ſcarlet cloth, and worn on the right ſhoulder.

EPENTHESIS, in grammar, the interpoſition or inſertion of a letter or ſyllable in the middle of a word; as *alituum*, for *alitum*; *relligio*, for *religio*; *induperator*, for *imperator*, &c.

EPEUS, of the line of Endymion, the inventor of the battering ram, an engine of great ſervice in ſieges to make a breach. He is thought to have built the Trojan horſe, and to have founded the city Metapontum.

EPHA, or EPHAH, in Jewiſh antiquity, a meaſure for things dry, equal to 3 pecks and 3 pints.

EPHEBÆUM, in antiquity, the place where the ephebi or youth exerciſed; or, as ſome ſay, where thoſe who deſigned to exerciſe met, and agreed what kind of exerciſe they ſhould contend in, and what ſhould be the victor's reward.

EPHEBI, among the Athenians, a deſignation given to their young men when they arrived at 18 years of age, at which time they had their names entered in a public regiſter.

EPHEDRA, in botany, a genus of the monodelphia order, belonging to the diœcia claſs of plants; and in the natural method ranking under the 51ſt order, *Coniferæ*. The male calyx is bifid; there is no corolla, but ſeven ſtamina; four antheræ inferior; three ſuperior. The female calyx is bipartite, and fivefold, one upon another; there is no corolla; there are two piſtils, and two ſeeds covered by the calyx, reſembling a berry.

EPHEMERA, from ημερα, "a day;" a diary fever, or a fever of one day's continuance only. In this caſe, ſuch a heat as attends an exceſs of wine, a pulſe ſomewhat full and quick, but ſoft and regular, a ſlight headach, a nauſea, and reſtleſſneſs, are all the ſymptoms, and which terminate without any ſenſible evacuation. If it continue unto the third day, it is not a diary fever; and if the conſtitution is very dry, an hectic is to be dreaded.

EPHEMERA, the *Day fly*, in zoology, a genus belonging to the order of neuroptera. It has no teeth or palpæ; there are two large protuberances above the eyes; the wings are erect, the two hind ones being largeſt; and the tail is briſtly. Theſe flies, who take their name from the ſhortneſs of their life, are diſtinguiſhed into ſeveral ſpecies. Some live ſeveral days, others do not take flight till the ſetting of the ſun, and live not to ſee the riſing of that luminary. Some exiſt but one hour, others but half that time; in which ſhort period they comply with the call of nature. With reſpect to thoſe who live ſeveral days, there is a peculiarity obſerved, incident to themſelves alone. They have to caſt off one ſlough more, an operation which ſometimes takes 24 hours to complete. To bring this about, they cling faſt to a tree. The ephemeræ, before they flutter in air, have in ſome manner been fiſhes. They remain in the ſtates of larva and chryſalis for one, two, or three years. The chryſalis only differs from the larva by there being obſervable on its back caſes for wings. Both have on their ſides ſmall fringes of hair, which, when put into motion, ſerve them as fins. Nothing can be more curious than the plying of thoſe little oars in the water. Their abdomen is terminated, as well as in their ſtate of flies, by three threads. Theſe larvæ ſcoop themſelves out dwellings in the banks of rivers; and they are ſmall tubes made like ſiphons, the one ſerving for an entrance, the other affording them an outlet. The banks of ſome rivers are often perforated with them. When the waters decreaſe, they dig freſh holes lower down, in order to enjoy their element the water. The ſeaſon and hour when the chryſalids of the different ſpecies of the ephemeræ turn into flies, maintain a kind of regularity. The heat, the riſe or fall of the waters, accelerate, however, or poſtpone their final diſplay. The ephemeræ of the Rhine appear in the air two hours before ſunſet. Theſe flies are hatched almoſt all at the ſame inſtant in ſuch numbers as to darken the air. The moſt early of thoſe on the Marne and Seine in France do not begin to fly till two hours after the ſetting of the ſun, towards the middle of Auguſt. They are ſeen fluttering and ſporting on the brink of their tomb. The glare of light attracts them, round which they perform a thouſand circles with amazing regularity. Their coming together for the purpoſe of generation can only be ſurmiſed, the ſhortneſs of their life requiring that all its functions ſhould be proportionable to their duration. Some naturaliſts have been of opinion, that the males impregnated the eggs after the manner of fiſhes. The females, by the help of the threads of their tail and the flapping of their wings, ſupport themſelves on the ſurface of the water, and in that almoſt upright ſituation drop their eggs in cluſters. One ſingle female will lay 700 or 800 eggs, which ſink to the bottom. The larvæ that eſcape from the voraciouſneſs of the fiſhes, ſet about the conſtruction of habitations to ſhelter them from every kind of danger. When the flies have propagated, they are ſeen to die and fall by heaps. The land and water are ſtrewed with them to a conſiderable thickneſs. The fiſhermen conſider theſe multitudes of deſtroyed inſects as manna for the fiſhes.

Barbut's Inſects.

Plate CLXXXII.

EPHEMERIDES, in aſtronomy, tables calculated by aſtronomers, ſhowing the preſent ſtate of the heavens for every day at noon; that is, the places wherein all the planets are found at that time. It is from theſe tables that the eclipſes, conjunctions, and aſpects of the planets, are determined; horoſcopes or celeſtial ſchemes conſtructed, &c. We have ephemerides of Origan, Kepler, Argoli, Heckerus, Mezzaracchis, Wing, De la Hire, Parker, &c. S. Caſſini has calculated ephemerides of the ſidera medicæa or ſatellites of Jupiter, which are of good uſe in determining the longitude.

In England, the Nautical Almanac, or Aſtronomical Ephemeris, publiſhed annually by anticipation, under the direction of the commiſſioners of longitude, is the moſt conſiderable. In France, celeſtial ephemerides have been publiſhed by M. Deſplaces every ten years, from 1715 to 1745: they were afterwards continued by the Abbé Caille, with many additions; of which an account may be ſeen in the Hiſtory of the Academy of Sciences for 1743. The Academy of Sciences have likewiſe publiſhed annually, from the beginning of the preſent century, a kind of ephemeris, under the title of *Connoiſſance des Tems*.

EPHESUS, a city of antiquity, much celebrated on account of its temple of Diana, and for being the moſt famous mart or ſtaple town of Hither Aſia. Epheſus was in ancient times the metropolis of all Aſia. Stephenus gives it the title of *Epiphaneſtate*, or *moſt illuſtrious*; and Pliny ſtyles it the ornament of Aſia. The ancient city ſtood about 50 miles ſouth of Smyrna, near the mouth of the river Cayſter, and the ſhore of the Icarian ſea, which is a bay of the Ægæan; but as it has been ſo often deſtroyed and rebuilt, it is no eaſy matter to determine the preciſe place. Moſt of our modern travellers are of opinion, that the ancient city ſtood more to the ſouth than the preſent; which they argue from the ruins that ſtill remain. Epheſus was, in ancient times, known by the names of *Alopes*, *Ortygia*, *Morges*, *Smyrna*, *Trachæa*, *Samornion*, and *Ptela*. It was called *Epheſus*, according to Heraclides, from the Greek word *epheſus*, ſignifying *permiſſion*; becauſe Hercules (ſays he) permitted the Amazons to live and build a city in that place. Others tell us, that Epheſus was the name of the Amazon that founded the city; for Pliny, Juſtin, and Oroſius, unanimouſly affirm that it was built by an Amazon; while others beſtow this honour upon Androclus, the ſon of Codrus, king of Athens, who was the chief of the Ionians that ſettled in Aſia. But in matters of ſo early a date, it is impoſſible to come at the truth, and therefore not worth our while to dwell on ſuch fruitleſs inquiries. What we know for certain is, that the city, which in the Roman times was the metropolis of all Aſia, acknowledged Lyſimachus for its founder; for that prince, having cauſed the ancient city to be entirely demoliſhed, rebuilt, at a vaſt expence, a new one, in a place more convenient, and nearer the temple. Strabo tells us, that, as the inhabitants ſhowed a great reluctance to quit their ancient habitations, Lyſimachus cauſed all the drains that conveyed the water into the neighbouring fens and the Cayſter to be privately ſtopped up; whereby the city being on the firſt violent rains in great part laid under water, and many of the inhabitants drowned, they were glad to abandon the ancient and retire to the new city. This new Epheſus was greatly damaged by an earthquake in the reign of Tiberius, but by that emperor repaired and adorned with ſeveral ſtately buildings, of which there are now but few ruins to be ſeen, and ſcarce any thing worthy of ancient Epheſus. The aqueduct, part of which is ſtill ſtanding, is generally believed to have been the work of the Greek emperors; the pillars which ſupport the arches are of fine marble, and higher or lower as the level of the water required. This aqueduct ſerved to convey water into the city from the ſpring of Halitee, mentioned by Pauſanias. The gate, now called by the inhabitants, for what reaſon we know not, *the Gate of Perſecution*, is remarkable for three bas-reliefs on the mould of an exquiſite taſte. The port, of which ſo many medals have been ſtruck, is at preſent but an open road, and not much frequented. The Cayſter was formerly navigable, and afforded a ſafe place for ſhips to ride in, but is now almoſt choked up with ſand.

But the chief ornament of Epheſus was the temple of Diana, built at the common charge of all the ſtates in Aſia, and for its ſtructure, ſize, and furniture, accounted among the wonders of the world. This great edifice was ſituated at the foot of a mountain, and at the head of a marſh; which place they choſe, if we believe Pliny, as the leaſt ſubject to earthquakes. This ſite doubled the charges; for they were obliged to be at a vaſt expence in making drains to convey the water that came down the hill into the moraſs and the Cayſter. Philo Byzantius tells us, that in this work they uſed ſuch a quantity of ſtone, as almoſt exhauſted all the quarries in the country; and theſe drains or vaults are what the preſent inhabitants take for a labyrinth. To ſecure the foundations of the conduits or ſewers, which were to bear a building of ſuch a prodigious weight, they laid beds of charcoal, ſays Pliny, well rammed, and upon them others of wool. Two hundred and twenty years, Pliny ſays 400, were ſpent in building this wonderful temple by all Aſia. It was 425 feet in length, and 200 in breadth, ſupported by 127 marble pillars, 70 feet high, of which 27 were moſt curiouſly carved, and the reſt poliſhed. Theſe pillars were the works of ſo many kings, and the bas-reliefs of one were done by Scopas, the moſt famous ſculptor of antiquity; the altar was almoſt wholly the work of Praxiteles. Cheiromocrates, who built the city of Alexandria, and offered to form Mount Athos into a ſtatue of Alexander, was the architect employed on this occaſion. The temple enjoyed the privilege of an aſylum, which at firſt extended to a furlong, was afterwards enlarged by Mithridates to a bow-ſhot, and doubled by Marc Antony, ſo that it took in part of the city: but Tiberius, to put a ſtop to the many abuſes and diſorders that attend privileges of this kind, revoked them all, and declared that no man guilty of any wicked or diſhoneſt action ſhould eſcape juſtice, though he fled to the altar itſelf.

The prieſts who officiated in this temple were held in great eſteem, and truſted with the care of ſacred virgins, or prieſteſſes, but not till they were made eunuchs. They were called *Eſtiatores* and *Eſſenæ*, had a particular diet, and were not allowed by their conſtitutions to go into any private houſe. They were maintained with the profits accruing from the lake Selinuſius, and another that fell into it, which muſt have been very conſiderable, ſince they erected a golden ſtatue to one Artemidorus, who being ſent to Rome, recovered them after they had been ſeized by the farmers of the public revenues. All the Ionians reſorted yearly to Epheſus, with their wives and children, where they ſolmnized the feſtival of Diana with great pomp and magnificence, making on that occaſion rich offerings to the goddeſs, and valuable preſents to her prieſts. The aſiarchæ, mentioned by St Luke, were, according to Beza, thoſe prieſts whoſe peculiar province it was to regulate the public ſports that were annually performed at Epheſus in honour of Diana: they were maintained with the collections made during the ſports; for all Aſia flocked to ſee them. The great Diana of the Epheſians, as ſhe was ſtyled by her blind adorers, was, according to Pliny, a ſmall ſtatue of ebony, made by one Canitia, though commonly believed to have been ſent down from heaven by Jupiter. This ſtatue was firſt placed in a nich, which, as we are told, the Amazons cauſed to be made in the trunk of an elm. Such was the firſt riſe of the veneration that was paid to Diana in this place. In proceſs of time the veneration for the goddeſs daily increaſing among the inhabitants of Aſia, a moſt ſtately and magnificent temple was built near the place where the elm ſtood, and the ſtatue of the goddeſs placed in it. This was the firſt temple; but not quite ſo ſumptuous as that which we have deſcribed, though reckoned, as well as the ſecond, among the wonders of the world. The ſecond, being that above deſcribed, was remaining in Pliny's time, and in Strabo's; and is ſuppoſed to have been deſtroyed in the reign of Conſtantine, purſuant to the edict by which that emperor commanded all the temples of the heathens to be thrown down and demoliſhed: the former was burnt the ſame day that Alexander was born, by one Eroſtratus, who owned on the rack, that the only thing which had prompted him to deſtroy ſo excellent a work, was the deſire of tranſmitting his name to future ages. Whereupon the common council of Aſia made a decree, forbidding any one to name him; but this prohibition ſerved only to make his name more memorable, ſuch a remarkable extravagance, or rather madneſs, being taken notice of by all the hiſtorians who have written of thoſe times. Alexander offered to rebuild the temple at his own expence, provided the Epheſians would agree to put his name on the front; but they rejected his offer in ſuch a manner as prevented the reſentment of that vain prince, telling him, that "it was not fit one god ſhould build a temple to another." The pillars, and other materials that had been ſaved out of the flames, were ſold, and alſo the jewels of the Epheſian women, who on that occaſion willingly parted with them; and the ſum raiſed from thence ſerved for the carrying on of the work till other contributions came in, which, in a ſhort time, amounted to an immenſe treaſure. This is the temple which Strabo, Pliny, and other Roman writers ſpeak of. It ſtood between the city and the port, and was built, or rather finiſhed, as Livy tells us, in the reign of king Servius. Of this wonderful ſtructure there is nothing at preſent remaining but ſome ruins, and a few broken pillars.

The Ionians firſt ſettled at Epheſus under the conduct of Androclus, who drove out the Carians and Leleges, by whom thoſe places were poſſeſſed at his arrival. The city, whither built by him, as Strabo affirms, or by one Crœſus or Epheſus, long before the Ionic migration, as others maintain, became ſoon the metropolis of Ionia. It was at firſt governed by Androclus, and his deſcendants, who aſſumed the royal title, and exerciſed the regal authority over the new colony: whence, even in Strabo's time, the poſterity of Androclus were ſtyled kings, and allowed to wear a ſcarlet robe, with a ſceptre, and all the enſigns of the royal dignity. In proceſs of time, a new form of government was introduced, and a ſenate eſtabliſhed; but when, or on what occaſion, this change happened, we know not. This kind of government continued till the time of Pythagoras, who lived before Cyrus the Great, and was one of the moſt cruel and inhuman tyrants we read of in hiſtory; for, having driven out the ſenate, and taken all the power into his own hands, he filled the city with blood and rapine, not ſparing even thoſe who fled to the temple of Diana for ſhelter. Pythagoras was ſucceeded by Pindarus, who bore the ſame ſway in the city; but treated the citizens with more humanity. In his time Epheſus being beſieged by Crœſus king of Lydia, he adviſed the inhabitants to devote their city to Diana, and faſten the wall, by a rope, to the pillars of her temple. They followed his advice, and were, from reverence to the goddeſs, not only treated with great kindneſs by Crœſus, but reſtored to their former liberty. Pindarus being obliged to reſign his power, retired to Peloponneſus. He was, according to Ælian, grandſon to Alyattes king of Lydia, and Crœſus's nephew. The other tyrants of Epheſus mentioned in hiſtory are, Athenagoras, Comas, Ariſtarchus, and Hegeſias; of whom the laſt was expelled by Alexander, who, coming to Epheſus, after having defeated the Perſians on the banks of the Granicus, beſtowed upon Diana all the tributes which the Epheſians had paid to the Perſians, and eſtabliſhed a democracy in the city. In the war between Mithridates and the Romans, they ſided with the former, and, by his direction, maſſacred all the Romans that reſided in their city; for which barbarity they were ſeverely fined, and reduced almoſt to beggary by Sylla, but afterwards treated kindly, and ſuffered to live according to their own laws, as is plain from ſeveral ancient inſcriptions and medals. The Epheſians were much addicted to ſuperſtition, ſorcery, and curious arts, as the ſcripture ſtyles them; whence came the proverb "Epheſian letters," ſignifying all ſorts of ſpells or charms.

In the time of the apoſtle Paul, Epheſus retained a great deal of its ancient grandeur. But it was a ruinous place, when the emperor Juſtinian filled Conſtantinople with its ſtatues, and raiſed his church of St Sophia upon its columns. Since then it has been almoſt quite exhauſted. Towards the end of the 11th century, a Turkiſh pirate, named *Tangripermes*, ſettled there. But the Greek admiral, John Ducas, defeated him in a bloody battle, and purſued the flying Turks up the Mæander. In 1306, it was among the places which ſuffered from the exactions of the grand-duke Roger; and two years after, it ſurrendered to ſultan Sayſan, who, to prevent future inſurrections, removed moſt of the inhabitants to Tyriæum, where they were maſſacred. Epheſus appears to have ſubſiſted as an inconſiderable place for ſome time. But now, the Epheſians are only a few Greek peaſants, living in extreme wretchedneſs, dependence, and inſenſibility; the repreſentatives of an illuſtrious people, and inhabiting the wreck of their greatneſs; ſome, the ſubſtructions of the glorious edifices which they raiſed; ſome, beneath the vaults of the Stadium, once the crowded ſcene of their diverſions; and ſome, by the abrupt precipice, in the ſepulchres which received their aſhes.

EPHETÆ (from ἐφίημι, "I ſend forth"), in antiquity, a ſort of magiſtrates among the Athenians, inſtituted by king Demophoon, to take cognizance of murder, man-ſlaughter, and chance-medley.

Their number was 100, whereof 50 were Athenians, and 50 Argians: they were not admitted to the poſt till upwards of 50 years of age. Draco new modelled it, excluded the Argians out of it, and made it to conſiſt of 51 Athenians, each above 50 years of age: Ubbo Emmius de Rep. Athen. ſays, he transferred to them part of the juriſdiction of the Areopagites. See AREOPAGUS.

EPHOD, in Jewiſh antiquity, one part of the prieſtly habit; being a kind of girdle, which, brought from behind the neck over the two ſhoulders, and hanging down before, was put acroſs the ſtomach, then carried round the waiſt, and made uſe of as a girdle to the tunic.—There were two ſorts of ephods, one of plain linen for the prieſts, and the other embroidered for the high prieſt.

EPHORI, in Grecian antiquity, magiſtrates eſtabliſhed in ancient Sparta to balance the regal power. The authority of the ephori was very great. They ſometimes expelled and even put to death the kings, and aboliſhed or ſuſpended the power of the other magiſtrates, calling them to account at pleaſure. There were five of them, others ſay nine. They preſided in the public ſhows and feſtivals. They were entruſted with the public treaſure; made war and peace; and were ſo abſolute, that Ariſtotle makes their government equal to the prerogative of a monarchy. They were eſtabliſhed by Lycurgus, according to the generality of authors: though this is denied by others, who date their origin 130 years after the time of that legiſlator. Thus Plutarch, in his Life of Cleomenes, aſcribes their inſtitution to Theopompus king of Sparta; which is alſo confirmed by the authority of Ariſtotle.

EPHORUS, an orator and hiſtorian of Cumæ in Æolia, about 352 years before Chriſt. He was diſciple to Iſocrates, by whoſe advice he wrote an hiſtory which gave an account of all the actions and battles that had happened between the Greeks and barbarians for 750 years. It was greatly eſteemed by the ancients; but is now loſt.

EPHRAIM (anc. geog.), one of the diviſions of Paleſtine by tribes: Ephraim and the half tribe of Manaſſeh are blended together by the ſacred writer; and it only appears that Ephraim occupied the more ſouthern, and the half tribe of Manaſſeh the more northern parts, but both ſeem to have extended from the Jordan to the ſea. Ephraim alſo denotes a kingdom, on the ſeparation of the 10 tribes from the houſe of David, called alſo the kingdom of Iſrael and of Samaria.

EPHRATA, a ſmall town of Pennſylvania in America, and the principal ſettlement of the religious ſect called *Dunkards* or *Tunkers*. See Tunkers.

EPHREM (Syrus), an ancient Chriſtian writer, in the fourth century, deacon of Edeſſa, was born at Niſibe, in Syria. He was greatly eſteemed by St Baſil, St Gregory, Nyſſen, and other great men. He wrote againſt the opinions of Sabellius, Arius, Apollonarius, the Manichees, &c. and acquired ſuch reputation by his virtue and his works, that he was called the *doctor and the prophet of the Syrians*. He died in 378. The beſt editions of his works are, that of Oxford, in 1708, in folio, and that of Rome, from 1732 to 1736, in Syriac, Greek, and Latin, 6 vols folio.

EPHYDOR, in antiquity, an officer in the Athenian courts of juſtice, who was to provide the plaintiff and defendant with equal water hour-glaſſes. When the glaſs was run out, they were not permitted to ſpeak any farther; and, therefore, we find them very careful not to loſe or miſpend one drop of their water. Whilſt the laws quoted by them were reciting, or if any other buſineſs happened to intervene, they gave orders that the glaſs ſhould be ſtopped.

EPIBATÆ, Επιϐαται, among the Greeks, marines or ſoldiers who ſerved on board the ſhips of war. They were armed in the ſame manner as the land-forces, only that more of them wore full or heavy armour.

EPIBATERION, a poetical compoſition, in uſe among the ancient Greeks. When any perſon of condition and quality returned home after a long abſence or journey into another country, he called together his friends and fellow-citizens, and made them a ſpeech, or rehearſed them a copy of verſes, wherein he returned ſolemn thanks to the immortal gods for his happy return; and ended with an addreſs by way of compliment to his fellow-citizens.—Theſe verſes made what the Greeks call επιϐατεριον, *epibaterium*, of επιϐαινω, "I go abroad". At going away they had another, called *apobaterium*.

EPIBATERIUM, in botany: A genus of the hexandria order, belonging to the monœcia claſs of plants. In the male flowers the calyx is a double perianthium, the outward one with ſix leaves, very ſmall; the inner one three-leaved, and three times larger than the former, with egg-ſhaped leaves. The corolla has ſix petals ſmaller than the interior calyx and roundiſh. The ſtamina are ſix capillary filaments, crooked, and as long as the petals; the antheræ are roundiſh. The female flowers are on the ſame plant. The calyx and corolla are as in the male. The pericarpium conſiſts of three roundiſh, monoſpermous plums; the ſeed a kidney-ſhaped compreſſed nut, ſomewhat furrowed.

EPIC, or Heroic, *Poem*, a poem expreſſed in narration, formed upon a ſtory partly real and partly feigned; repreſenting, in a ſublime ſtyle, ſome ſignal and fortunate action, diſtinguiſhed by a variety of great events, to form the morals, and affect the mind with the love of heroic virtue.

We may diſtinguiſh three parts of the definition, namely, the matter, the form, and the end. The matter includes the action of the fable, under which are ranged the incidents, epiſodes, characters, morals, and machinery. The form comprehends the way or manner of the narration, whether by the poet himſelf, or by any perſons introduced, whoſe diſcourſes are related: to this branch likewiſe belong the moving of the paſſions, the deſcriptions, diſcourſes, ſentiments, thoughts, ſtyle, and verſification; and beſides theſe, the ſimilies, tropes, figures, and, in ſhort, all the ornaments and decorations of the poem. The end is to improve our morals and increaſe our virtue. See Poetry.

EPICEDION (formed of επι *upon*, and κηδος *funeral*), in the Greek and Latin poetry, a poem, or poetical compoſition, on the death of a perſon.—At the obſequies of any man of figure, there were three kinds of diſcourſes uſually made; that rehearſed at his *buſtum* or funeral pile, was called *nenia*; that engraven on his tomb, *epitaph*; and that ſpoken in the ceremony of his funeral, *epicedion*. We have two beautiful epicedions in Virgil, that of Euryalus and that of Pallas.

EPICEDIUM, in ancient poetry, a poem rehearſed during the funeral ſolemnity of perſons of diſtinction.

EPICHARMUS, an ancient poet and philoſopher, born in Sicily, was a ſcholar of Pythagoras. He is ſaid to have introduced comedy at Syracuſe in the reign of Hiero. Horace commends Plautus for imitating him, in following the chace of the intrigue ſo cloſely as not to give the readers or ſpectators time to trouble themſelves with doubts concerning the diſcovery. He wrote likewiſe treatiſes concerning philoſophy and medicine; but none of his works have been preſerved. He died aged 90, according to Laertius, who has preſerved four verſes inſcribed on his ſtatue.

EPICHIROTONIA, among the Athenians. It was ordained by Solon, that once every year the laws ſhould be carefully reviſed and examined; and if any of them were found unſuitable to the preſent ſtate of affairs, they ſhould be repealed. This was called επιχειροτονια των νομων, from the manner of giving their ſuffrages by *holding up their hands*. See a farther account of this cuſtom in Pott. Archæol. Græc. lib. 1. cap. 26. tom. i. p. 142.

EPICOENE, in grammar, a term applied to nouns, which, under the ſame gender and termination, mark indifferently the male and female ſpecies. Such in Latin is *aquila*, *veſpertilio*, &c. which ſignify equally a male or female eagle or bat.

Grammarians diſtinguiſh between *epicœne* and *common*. A noun is ſaid to be common of two kinds, when it may be joined either with a maſculine or a feminine article; and epicœne, when it is always joined to ſome of the two articles, and yet ſignifies both genders.

EPICTETUS, a celebrated Stoic philoſopher, born at Hierapolis in Phrygia, in the firſt century, was the ſlave of Epaphroditus, a freedman and one of Nero's guard. Domitian baniſhing all philoſophers from Rome, about the year 94, Epictetus retired to Nicopolis in Epirus, where he died in a very advanced age; and after his death, the earthen lamp he made uſe of ſold for 3000 drachmas. He was a man of great modeſty; which was eminent in his own practice, as well as in his recommendation to others: hence he uſed to ſay, "That there is no need of adorning a man's houſe with rich hangings or paintings, ſince the moſt graceful furniture is temperance and modeſty, which are laſting ornaments, and will never be the worſe for wearing." Of all the ancient philoſophers, he ſeems to have made the neareſt approaches to the Chriſtian morality, and to have had the moſt juſt ideas of God and providence. He always poſſeſſed a cool and ſerene mind, unruffled by paſſion; and was uſed to ſay, that the whole of moral philoſophy was included in theſe words, *ſupport* and *abſtain*. One day, his maſter Epaphroditus ſtrove in a frolic to wrench his leg; when Epictetus ſaid, with a ſmile, and free from any emotion, "If you go on, you will certainly break my leg:" but the former redoubling his effort, and ſtriking it with all his ſtrength, he at laſt broke the bone; when all the return Epictetus made was, "Did not I tell you, Sir, that you would break my leg?" No man was more expert at reducing the rigour of the maxims of the Stoics into practice. He conformed himſelf ſtrictly, both in his diſcourſe and behaviour, to the manners of Socrates and Zeno. He waged continual war with fancy and fortune; and it is an excellence peculiar to himſelf, that he admitted all the ſeverity of the Stoics without their ſourneſs, and reformed Stoiciſm as well as profeſſed it; and beſides his vindicating the immortality of the ſoul as ſtrenuouſly as Socrates or any Stoic of them all, he declared openly againſt ſelf murder, the lawfulneſs of which was maintained by the reſt of the ſect. Arrian, his diſciple, wrote a large account of his life and death, which is loſt; and preſerved four books of his diſcourſes and his Enchiridion, of which there have been ſeveral editions in Greek and Latin; and, in 1758, a tranſlation of them into Engliſh was publiſhed by the learned and ingenious Miſs Carter.

EPICUREAN PHILOSOPHY, the doctrine or ſyſtem of philoſophy maintained by Epicurus and his followers.

His philoſophy conſiſted of three parts; canonical, phyſical, and ethereal. The firſt was about the canons or rules of judging. The cenſure which Tully paſſes upon him for his deſpiſing logic, will hold true only with regard to the logic of the Stoics, which he could not approve of, as being too full of nicety and quirk. Epicurus was not acquainted with the analytical method of diviſion and argumentation, nor was he ſo curious in modes and formation as the Stoics. Soundneſs and ſimplicity of ſenſe, aſſiſted with ſome natural reflections, was all his art. His ſearch after truth proceeded only by the ſenſes; to the evidence of which he gave ſo great a certainty, that he conſidered them as an infallible rule of truth, and termed them the *firſt natural light of mankind*.

In the ſecond part of this philoſophy he laid down atoms, ſpace, and gravity, as the firſt principles of all things: he did not deny the exiſtence of God, but thought it beneath his majeſty to concern himſelf with human affairs; he held him a bleſſed immortal Being, having no affairs of his own to take care of, and above meddling with thoſe of others.

As to his ethics, he made the ſupreme good of man to conſiſt in pleaſure, and conſequently ſupreme evil in pain. Nature itſelf, ſays he, teaches us this truth; and prompts us from our birth to procure whatever gives us pleaſure, and avoid what gives us pain. To this end he propoſes a remedy againſt the ſharpneſs of pain: this was to divert the mind from it, by turning our whole attention upon the pleaſures we have formerly enjoyed. He held that the wiſe man muſt be happy, as long as he is wiſe: the pain, not depriving him of his wiſdom, cannot deprive him of his happineſs.

There is nothing that has a fairer ſhow of honeſty than the moral doctrine of Epicurus. Gaſſendus pretends, that the pleaſure in which this philoſopher has fixed the ſovereign good, was nothing elſe but the higheſt tranquillity of mind, in conjunction with the moſt perfect health of body: but Tully, Horace, and Plutarch, as well as almoſt all the fathers of the church, give us a very different repreſentation: indeed the nature of this pleaſure, in which the chief happineſs is ſuppoſed to be ſeated, is a grand problem in the morals of Epicurus. Hence there were two kinds of Epicureans, the rigid and the remiſs: the firſt were thoſe who underſtood Epicurus's notion of pleaſure in the beſt ſenſe, and placed all their happineſs in the pure pleaſures of the mind, reſulting from the practice of virtue: the looſe or remiſs Epicureans, taking the words of that philoſopher in a groſs ſenſe, placed all their happineſs in bodily pleaſures or debauchery.

EPICURUS, the greateſt philoſopher of his age, was born at Gargettium in Attica, about 340 B. C. in the 109th Olympiad. He ſettled at Athens in a fine garden he had bought; where he lived with his friends in great tranquillity, and educated a great number of diſciples. They lived all in common with their maſter. The reſpect which his followers paid to his memory is admirable: his ſchool was never divided, but his doctrine was followed as an oracle. His birth-day was ſtill kept in Pliny's time; the month he was born in was obſerved as a continued feſtival; and they placed his picture every where. He wrote a great many books, and valued himſelf upon making no quotations. He raiſed the atomical ſyſtem to a great reputation, though he was not the inventor of it, but had only made ſome change in that of Democritus. As to his doctrine concerning the ſupreme good or happineſs, it was very liable to be miſrepreſented, and ſome ill effects proceeded from thence, which diſcredited his ſect. He was charged with perverting the worſhip of the gods, and inciting men to debauchery; but he did not forget himſelf on this occaſion: he publiſhed his opinions to the whole world; he wrote ſome books of devotion; recommended the veneration of the gods, ſobriety, and chaſtity; and it is certain that he lived in an exemplary manner, and conformably to the rules of philoſophical wiſdom and frugality. Timocrites, a deſerter of his ſect, ſpoke very ſcandalouſly of him. Gaſſendus has given us all he could collect from the ancients concerning the perſon and doctrine of this philoſopher; who died of a ſuppreſſion of urine, aged 72.

EPICYCLE, in the ancient aſtronomy, a little circle whoſe centre is in the circumference of a greater circle: or it is a ſmall orb or ſphere, which being fixed in the deferent of a planet, is carried along with it; and yet, by his own peculiar motion, carries the planet faſtened to it round its proper centre.

It was by means of epicycles that Ptolemy and his followers ſolved the various phenomena of the planets, but more eſpecially their ſtations and retrogradations.

EPICYCLOID, in geometry, a curve generated by the revolution of the periphery of a circle, along the convex or concave ſide of the periphery of another circle.

EPICYEMA, among phyſicians, denotes a ſuperfetation; being a falſe conception or mole happening after the birth of a regular fetus.

EPIDAURUM, EPIDAURUS, or EPITAURUM, (anc. geog.), a town of Dalmatia, on the Adriatic, built the ſame year, as is ſaid, with Dyrrachium, 430 years after the deſtruction of Troy: A conſiderable town formerly, but now reduced to a ſmall village, called *Raguſi Vecchio*; diſtant ſix miles from the modern Raguſi. E. Long. 19°. Lat. 42°, 20′.

EPIDAURUS (anc. geog.), a town of Argolis, in Peloponneſus, on the Saronic bay, to the ſouth of the promontory *Spiræum*; called *ſacred*, becauſe of the religious veneration paid to Æſculapius, whoſe temple ſtood at the diſtance of five miles from the town. The Romans, during a peſtilence, being adviſed to convey the god to Rome, ſent a ſhip, with a ſolemn embaſſy, for his conveyance: but while the Epidaurians were in ſuſpenſe to part with him, a huge ſerpent ſailed to the ſhip; and, being taken for the god, was carried to Rome in great ſolemnity. Epidaurus ſtood in a receſs of the bay, fronting the eaſt; and was fortified by nature, being incloſed by high mountains reaching to the ſea, and rendering it difficult of acceſs. It had ſeveral temples, and in the acropolis or citadel was a remarkable ſtatue of Minerva. The ſite is now called *Epi-thavro*. The traces are indiſtinct, and it has probably been long deſerted. The harbour of Epidaurus is long. Its periplus or circuit was 15 ſtadia or near two miles. The entrance is between mountains, and on a ſmall rocky peninſula on the left hand are ruins of a modern fortreſs. This, it ſeems, was the point on which a temple of Juno ſtood. It is frequented by veſſels for wood or corn. The grove of Æſculapius was incloſed by mountains, within which all the ſacrifices as well of the Epidaurians as of ſtrangers were conſumed. One was called Titthion; and on this the god when an infant was ſaid to have been expoſed, and to have been ſuckled by a ſhe-goat. He was a great phyſician, and his temple was always crowded with ſick perſons. Beyond it was the dormitory of the ſuppliants; and near it, a circular edifice called the *Tholus*, built by Polycletus, of white marble, worth ſeeing. The grove, beſides other temples, was adorned with a portico, and a fountain remarkable for its roof and decorations. The bath of Æſculapius was one of the benefactions of Antoninus Pius, while a Roman ſenator; as was alſo a houſe for the reception of pregnant women and dying perſons, who before were removed out of the incloſure, to be delivered or to expire in the open air. The remains are heaps of ſtones, pieces of brick wall, and ſcattered fragments of marble; beſides ſome churches or rather piles of rubbiſh miſ-called, being deſtitute of doors, roofs, or any kind of ornament. The ſtatue of Æſculapius was half as big as that of Jupiter Olympius at Athens. It was made of ivory and gold, and, as the inſcription proved, by Thraſymedes ſon of Arignotus of Paros. He was repreſented ſitting, holding his ſtaff, with one hand on the head of a ſerpent, and a dog lying by him. Two Argive heroes, Bellerophon combating with the monſter Chimæra, and Perſeus ſevering the head of Meduſa, were carved on the throne. Many tablets deſcribed the cures performed by the deity, yet he had not eſcaped contumely and robbery. Dionyſius deprived him of his golden beard. affirming it was very unſeemly in him to appear in that manner when his father Apollo was always ſeen with his face ſmooth. Sylla amaſſed the precious offerings belonging to him and to Apollo and Jupiter at Delphi and Olympia, to pay his army before Athens. The marks in the walls teſtified that a great number had been plucked down. A few fragments of white marble exquiſitely carved occur in the heap of the temple. The incloſure of the temple once abounded in inſcriptions. In the ſecond century ſix marbles remained, on which were written in the Doric dialect the names of men and women who had been patients of the god, with the diſtemper each had laboured under, and the remedies he had directed. Dr Chandler found only a couple of votive inſcriptions, and two pedeſtals of ſtatues, one of which repreſented a Roman, and was erected by the city of the Epidaurians. The Stadium was near the temple. It was of earth, as moſt in Greece were. At the upper end are ſeats of ſtone, but theſe were continued along the ſides only a few yards. A vaulted paſſage leading underneath into the area, now choked up, was a private way by which the Agonothetæ or preſidents with the prieſts and perſons of diſtinction entered. Two large ciſterns or reſervoirs remain, made by Antoninus for the reception of rain-water. Beyond them is a dry water-courſe; and in the mountain-ſide on the right-hand are the marble ſeats of the theatre, overgrown with buſhes. The ſprings and wells by the ruins are now ſuppoſed to poſſeſs many excellent properties. To theſe and a good air, Dr Chandler thinks, with the recreations of the theatre and of the ſtadium, and to the medicinal knowledge and experience of the prieſts, may be attributed both the recovery of the ſick and the reputation of Æſculapius.

EPIDAURUS, with the ſurname *Limera*, to diſtinguiſh it from the Epidaurus of Argolis; called ſo, either from its meadows or its commodious harbours (Stephanus, Apollodorus): a town of Laconica, on the Ionian ſea, to the ſouth of the Sinus Argolicus, ſituated where now Molvaſia ſtands, in the Morea. E. Long. 23. 30. Lat. 35. 40.

EPIDEMIA, in Grecian antiquity, feſtivals kept in honour of Apollo and Diana, at the ſtated ſeaſons when

when thoſe deities, who could not be preſent every where, were ſuppoſed to viſit different places, in order to receive the vows of their adorers.

EPIDEMIC, among phyſicians, an epithet of diſeaſes which at certain times are popular, attacking great numbers at or near the ſame time.

EPIDENDRUM, in botany: A genus of the diandria order, belonging to the gynandria claſs of plants; and in the natural method ranking under the ſeventh order, *Orchideæ*. The nectarium is turbinated, oblique, and reflexed. This is the plant which produces the fruit called *vanilla*, and which is uſed in the making of chocolate. It is a native of Mexico, and alſo of ſome parts of the Eaſt Indies. It is a paraſitic plant; the leaves of which greatly reſemble the vine, and are about 18 inches long and three inches broad. The flowers are of a white colour intermixed with ſtripes of red and yellow. When theſe fall off, they are quickly ſucceeded by the pods, which at firſt are green, but afterwards, as they ripen, become yellow, and are gathered for uſe. The pods of the beſt vanilla are long, ſlender, and well filled with ſeeds. If opened when freſh, the cavity of the pod is found to contain a humid ſubſtance that is black, oily, and balſamic, of ſuch a ſtrong ſmell, that it frequently cauſes headachs, and even a ſort of temporary intoxication. The ſeaſon for gathering the pods begins about the latter end of September, and laſts till the end of December. They are dried in the ſhade; and when dry and fit for keeping, they are rubbed externally with a little oil of cocoa or calba, to render them ſupple, or preſerve them the better, and to prevent them from becoming too dry or brittle. The uſe of this fruit is only for perfuming chocolate. In New Spain it is reckoned unwholeſome; and therefore never uſed: but in England and other countries of Europe, it is a conſtant ingredient; and perhaps its noxious qualities may be corrected by the ſea-air. In thoſe countries where they grow, the plants are very eaſily propagated by cuttings. In this country they require to be kept in a ſtove, and alſo to be placed near ſome American tree, round which they may climb for their ſupport.

EPIDERMIS, in anatomy, the cuticle or ſcarfſkin. See Anatomy, n° 74. The word is formed of the Greek επι, *on, over*; and δερμα, *ſkin.*

EPIDICASIA, among the Athenians. Daughters inheriting their parents eſtate, were obliged to marry their neareſt relation; which gave occaſion to perſons of the ſame family to go to law with one another, each pretending to be more nearly allied to the heireſs than the reſt. The ſuit was called επιδικασιας δικη: and the virgin, about whom the relations conteſted, επιδικος.

EPIDIDYMIS, in anatomy, a little round body, on the back of each teſticle; called alſo *paraſtata*. See Anatomy, p. 738, col. 1.

EPIGÆA, in botany: A genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 18th order, *Bicornes*.

EPIDOTÆ, certain deities who preſided over the growth of children. They were worſhipped by the Lacedæmonians, and chiefly invoked by thoſe who were perſecuted by the ghoſts of the dead, &c.

EPIGASTRIC region, a part or ſubdiviſion of the abdomen. See Anatomy, n° 88.

EPIGLOTTIS, in anatomy, one of the cartilages of the larynx or wind-pipe. See Anatomy, n° 104, par. 3. and n° 116.

EPIGONI, the ſons and deſcendants of the Grecian heroes who were killed in the firſt Theban war. The war of the Epigoni is famous in ancient hiſtory. It was undertaken ten years after the firſt. The ſons of thoſe that had periſhed in the firſt war, reſolved to avenge the death of their fathers, and marched againſt Thebes, under the command of Therſander; or, according to others, of Alcmæon the ſon of Amphiaraus, about 1307 years before Chriſt. The Argives were aſſiſted by the Corinthians, the people of Meſſenia, Arcadia, and Megara. The Thebans had engaged all their neighbours in their quarrel, as in one common cauſe. Theſe two hoſtile armies met and engaged on the banks of the Gliſſas. The fight was obſtinate and bloody, but victory declared for the Epigoni, and ſome of the Thebans fled to Illyricum with Leodamas their general, while others retired into Thebes, where they were ſoon beſieged, and forced to ſurrender. In this war Ægialeus was the only one who was killed, and his father Adraſtus was the only one who eſcaped alive in the firſt war. This whole war, as Pauſanias obſerves, was written in verſe; and Callinus, who quotes ſome of the verſes, aſcribes them to Homer, which opinion has been adopted by many writers. "For my part (continues the geographer), I own, that next to the Iliad and Odyſſey of Homer, I have never ſeen a finer poem." The deſcendants of the veteran Macedonians, who ſerved under Alexander the Great, and who had children by Aſiatic women, were alſo called *Epigoni*, (Juſtin.)

EPIGRAM, in poetry, a ſhort poem in verſe, treating only of one thing, and ending with ſome lively, ingenious, and natural thought or point. The word is formed of επιγραμμα *inſcription*, of επιγραφειν *to inſcribe* or *write upon.*

Epigrams then, originally, ſignify inſcriptions, and they derive their origin from thoſe inſcriptions placed by the ancients on their tombs, ſtatues, temples, triumphal arches, &c. Theſe, at firſt, were only ſimple monograms: afterwards, increaſing their length, they made them in verſe, to be the more eaſily retained: Herodotus, and others, have tranſmitted to us ſeveral of them. Such little poems retained the name of epigrams, even after the deſign of their firſt inſtitution was varied, and people began to uſe them for the relation of little facts and accidents, the characterizing of perſons, &c. The point or turn is a quality much inſiſted on by the critics, who require the epigram conſtantly to cloſe with ſomething poignant and unexpected, to which all the reſt of the compoſition is only preparatory; while others, on the contrary, exclude the point, and require the thought to be equally diffuſed throughout the poem, without laying the whole ſtreſs on the cloſe: the former is uſually Martial's practice, and the latter that of Catullus.

The Greek epigrams have ſcarce any thing of the point or briſkneſs of the Latin ones: thoſe collected in the Anthology, have moſt of them a remarkable air of eaſe and ſimplicity, attended with ſomething juſt and witty; ſuch as we find in a ſenſible peaſant, or a child that has wit. They have nothing that bites, but ſomething that tickles. Though they want the ſalt of Martial, yet to a good taſte they are not inſipid; except a few of them, which are quite flat and ſpiritleſs. However, the general faintneſs and delicacy of the pleaſantry in them, has given occaſion for a Greek epigram, or *epigram à la Greque*, to denote, among the French, an epigram void of ſalt or ſharpneſs.

The epigram admits of great variety of ſubjects: ſome are made to praiſe, and others to ſatirize; which laſt are much the eaſieſt, ill-nature ſerving inſtead of point and wit. Boileau's epigrams are all ſatires on one or another; thoſe of des Reaux are all made in honour of his friends; and thoſe of Mad. Scudery are ſo many eloges. The epigram being only a ſingle thought, it would be ridiculous to expreſs it in a great number of verſes.

EPIGRAPHE, among antiquarians, denotes the inſcription of a building, pointing out the time when, the perſons by whom, the uſes, and the like, for which it was erected.

EPILEPSY, in medicine, the ſame with what is otherwiſe called the *falling-ſickneſs*, from the patient's falling ſuddenly to the ground. See *Medicine-Index*.

EPILOBIUM, the WILLOW-HERB, in botany: A genus of the monogynia order, belonging to the octandria claſs of plants; and in the natural method ranking under the 17th order, *Calycanthemæ*. The calyx is quadrifid; the petals four; the capſule oblong inferior; the ſeeds pappous or downy. There are ſeven ſpecies, all of them natives of Britain. They grow in marſhes, or under hedges in moiſt and ſhady places; having bloſſoms generally of a red colour, and ſometimes of conſiderable beauty. The moſt remarkable is the hirſutum, commonly called *codlins and cream*. The top-ſhoots of this plant have a very delicate fragrancy; but ſo tranſitory, that before they have been gathered five minutes, it is no longer perceptible. Horſes, ſheep, and goats eat this plant; cows are not fond of it; ſwine refuſe it. An infuſion of the leaves of another ſpecies, the anguſtifolium, or roſebay willow-herb, has an intoxicating quality, as the inhabitants of Kamtſchatka have learned. Theſe people alſo eat the white young ſhoots which creep under the ground, and have a ſort of ale brewed from the dried pith of it. The down of the ſeeds has been lately manufactured by mixing it with cotton or beaver's hair.

EPILOGUE, in oratory, the end or concluſion of a diſcourſe, ordinarily containing a recapitulation of the principal matters delivered.

EPILOGUE, in dramatic poetry, a ſpeech addreſſed to the audience, after the play is over, by one of the principal actors therein; uſually containing ſome reflections on certain incidents in the play, eſpecially thoſe in the part of the perſon that ſpeaks it; and having ſomewhat of pleaſantry, intended to compoſe the paſſions raiſed in the courſe of the repreſentation: A practice which is ridiculed by the *Spectator*; and compared to a merry jigg upon the organ after a good ſermon, to wipe away any impreſſions that might have been made thereby, and ſend the people away juſt as they came.

EPIMEDIUM, BARREN-WORT, in botany: A genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 24th order, *Corydales*. There are four nectaria, cup-ſhaped, and lying on the petals. The corolla is tetrapetalous, the calyx dropping off. The ſeed-veſſel is a pod. There is only one ſpecies, *viz.* the alpinum. It is a low herbaceous plant, with a creeping root, having many ſtalks about nine inches high, each of which has three flowers compoſed of four leaves placed in the form of a croſs. They are of a reddiſh colour, with yellow ſtripes on the border.

EPIMENIDES, an ancient poet and philoſopher, was born at Gnoſſus in Crete. Contrary to the cuſtom of his country, he always wore his hair long; which, according to ſome, was becauſe he was aſhamed of being thought a Cretan: and indeed he does not ſeem to have had a high opinion of his countrymen, if that verſe cited by St Paul be, as it is generally believed to be, his; "The Cretans are always liars, evil beaſts, ſlow bellies." Many ſtories are related of him, too wonderful to merit attention; however, his reputation was ſo great over all Greece, that he was there eſteemed a favourite of the gods. The Athenians being afflicted with the plague, and commanded by the oracle to make a ſolemn luſtration of the city, ſent Nicias, the ſon of Niceratus, with a ſhip to Crete, to deſire Epimenides to come to them. He accepted their invitation, accompanied the meſſengers to Athens, performed the luſtration of the city, and the plague ceaſed. Here he contracted an acquaintance with Solon, whom he privately inſtructed in the proper methods for the regulation of the Athenian commonwealth. Having finiſhed his buſineſs at Athens, the citizens offered him many valuable preſents and high honours, and appointed a ſhip to carry him back to Crete: but he returned their preſents, and would accept of nothing except a little branch of the ſacred olive preſerved in the citadel; and deſired the Athenians to enter into an alliance with the Gnoſſians. Having obtained this, he returned to Crete; where he died ſoon after, aged 157 years; or as the Cretans, conſiſtently with their character, pretended, 299. He was a great poet, and wrote 5000 verſes on "the genealogy of the gods," 6500 "on the building of the ſhip Argos and Jaſon's expedition to Colchis," and 4000 "concerning Minos and Rhadamanthus." He wrote alſo in proſe, "Concerning ſacrifices and the commonwealth of Crete." St Jerom likewiſe mentions his "book of oracles and reſponſes." The Lacedemonians procured his body, and preſerved it among them by the advice of an oracle; and Plutarch tells us, that he was reckoned the ſeventh wiſe man by thoſe who refuſed to admit Periander into the number.

EPIMETHEUS, a ſon of Japetus and Clymene, one of the Oceanides, who inconſiderately married Pandora, by whom he had Pyrrha, the wife of Deucalion. He had the curioſity to open the box which Pandora had brought with her, and from thence iſſued a train of evils, which from that moment have never ceaſed to afflict the human race. Hope was the only one which remained at the bottom of the box, not having a ſufficient time to eſcape, and it is ſhe alone which comforts men under misfortunes. Epimetheus was changed into a monkey by the gods, and ſent into the iſland Pithecuſa.

EPIPHANIUS (St), an ancient father of the church, born at Beſanducan, a village in Paleſtine, about the year 332. He founded a monaſtery near the place of his birth, and preſided over it. He was afterwards elected biſhop of Salamis; when he ſided with Paulinus againſt Meletius, and ordained in Paleſtine, Paulinian the brother of St Jerom; on which a conteſt aroſe between him and John biſhop of Jeruſalem. He afterwards called a council in the iſland of Cyprus, in which he procured a prohibition of the reading of Origen's writings; and made uſe of all his endeavours to prevail on Theophilus biſhop of Alexandria to engage St Chryſoſtom to declare in favour of that decree: but not meeting with ſucceſs, he went himſelf to Conſtantinople, where he would not have any converſation with St Chryſoſtom: and formed the deſign of entering the church of the apoſtles, to publiſh his condemnation of Origen; but being informed of the danger to which he would be expoſed, he reſolved to return to Cyprus; but died at ſea, in the year 403. His works were printed in Greek, at Baſil, 1544, in folio; and were afterwards tranſlated into Latin, in which language they have been often reprinted. Petavius reviſed and corrected the Greek text by two manuſcripts, and publiſhed it together with a new tranſlation at Paris in 1622. This edition was reprinted at Cologne in 1682.

EPIPHANY, a Chriſtian feſtival, otherwiſe called the *Manifeſtation of Chriſt to the Gentiles*, obſerved on the ſixth of January, in honour of the appearance of our Saviour to the three magi or wiſe men, who came to adore him and bring him preſents. The feaſt of epiphany was not originally a diſtinct feſtival; but made a part of that of the nativity of Chriſt, which being celebrated 12 days, the firſt and laſt of which were high or chief days of ſolemnity, either of theſe might properly be called *epiphany*, as that word ſignifies the appearance of Chriſt in the world.

The word in the original Greek, επιφανια, ſignifies *appearance* or *apparition*; and was applied, as ſome critics will have it, to this feaſt, on account of the ſtar which appeared to the magi.— St Jerom and St Chryſoſtom take the epiphany for the day of our Saviour's baptiſm, when he was declared to men by the voice, *Hic eſt filius meus dilectus, in quo mihi complacui:* "This is my beloved Son, in whom I am well pleaſed." And accordingly it is ſtill obſerved by the Cophtæ and Ethiopians in that view. Others contend, that the feaſt of Chriſtmas, or the nativity of our Saviour, was held in divers churches on this day; which had the denomination *epiphany*, or *appearance*, by reaſon of our Saviour's firſt appearance on earth at that time. And it muſt be allowed, that the word is uſed among the ancient Greek fathers, not for the appearance of the ſtar to the magi, but for that of our Saviour to the world: In which ſenſe, St Paul uſes the word *epiphania*, in his ſecond epiſtle to Timothy, i. 10.

EPIPHONEMA. See ORATORY, n° 96.

EPIPHORA, in medicine, a preternatural defluxion of the eyes, when they continually diſcharge a ſharp ſerous humour, which excoriates the cheeks.

EPIPHYSIS, in anatomy. See ANATOMY, p. 677. col. 2.

EPIPLOCELE, in medicine, is a kind of hernia or rupture, in which the omentum ſubſides into the ſcrotum.

EPIPLOOMPHALON, in medicine, an hernia umbilicalis, proceeding from the omentum falling into the region of the umbilicus or navel.

EPIPLOON. See OMENTUM.

EPIRUS, a diſtrict of ancient Greece, bounded on the eaſt by Etolia, on the weſt by the Adriatic, on the north by Theſſaly and Macedon, and on the ſouth by the Ionian ſea. This country was anciently governed by its own princes, in which ſtate it made a very conſiderable figure. The country, according to Joſephus, was firſt peopled by Dodanim the ſon of Javan and grandſon of Japhet. The people were very warlike: but they continued in their ſavage ſtate long after their neighbours were civilized; whence the Iſlanders uſed to threaten their offenders with tranſportation to Epirus. Their horſes were in great requeſt among the ancients, as well as the dogs produced in one of the diviſions called *Moloſſus*; and hence theſe dogs were called by the Romans *Moloſſi*.

The hiſtory of Epirus commences with the reign of Pyrrhus the ſon of Achilles by Deidamia the daughter of Lycomedes king of Scyros. He is ſaid to have behaved with great bravery at the ſiege of Troy; but it would appear that he behaved with no leſs barbarity. After the city was taken, he is ſaid to have killed old king Priam with his own hand; to have thrown Aſtyanax the ſon of Hector and Andromache headlong from an high tower; and ſacrificed Polyxena the daughter of Priam on the tomb of his father. He carried Andromache with him into Epirus, where he ſettled by the advice of the famous ſoothſayer Helenus, one of Priam's ſons, who had ſerved during the Trojan war both under his father and himſelf. The only remarkable period of the hiſtory of Epirus is the reign of Pyrrhus II. who made war upon the Romans. He was invited into Italy by the Tarentines; and embarked about 280 B. C. After having eſcaped many dangers by ſea, he landed in that country, and with great difficulty gained a victory over the Romans; but he was afterwards utterly defeated by them [†], and obliged to return into his own country. To retrieve his honour, he then undertook an expedition againſt Macedon; where he overthrew Antigonus, and at laſt made himſelf maſter of the whole kingdom. He then formed a deſign of ſubduing all the other Grecian ſtates; but met with ſuch an obſtinate reſiſtance at Lacedæmon, that he was obliged to drop the enterprize; and was ſoon after killed at the ſiege of Argos by a woman, who from the wall threw a tile upon his head. Deidamia, the grand-daughter of Pyrrhus, was the laſt that ſat on the throne of Epirus. She is ſaid to have been murdered after a ſhort reign; upon which the Epirots formed themſelves into a republic.

Under the new form of government Epirus never made any conſiderable figure, but ſeems rather to have been dependent on the kingdom of Macedon. The Romans having conquered Philip king of that country, reſtored the Epirots to their ancient liberty; but they, forgetful of this favour, ſoon after took up arms in favour of Perſeus. As a puniſhment for this ingratitude, the Romans gave orders to Paulus Emilius, after the reduction of Macedon, to plunder the cities of Epirus, and level them with the ground. This was punctually executed throughout the whole country on the ſame day and at the ſame hour. The booty was ſold, and each

[†] See *Ro*

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each foot-ſoldier had 200 denarii, that is, ſix pounds nine ſhillings and two pence, and each of the horſe the double of this ſum. An hundred and fifty thouſand men were made ſlaves, and ſold to the beſt bidder for the benefit of the republic. Nor did the vengeance of Rome ſtop here; all the cities of Epirus, to the number of 70, were diſmantled, and the chief men of the country carried to Rome, where they were tried, and moſt of them condemned to perpetual impriſonment. After this terrible blow, Epirus never recovered its ancient ſplendor. Upon the diſſolution of the Achæan league, it was made part of the province of Macedon; but when Macedon became a dioceſe, Epirus was made a province of itſelf, called the province of *Old Epirus*, to diſtinguiſh it from *New Epirus*, another province lying to the eaſt of it. On the diviſion of the empire, it fell to the emperors of the eaſt, and continued under them till the taking of Conſtantinople by the Latins, when Michael Angelus, a prince nearly related to the Greek emperor, ſeized on Etolia and Epirus, of which he declared himſelf deſpot or prince; and was ſucceeded by his brother Theodorus, who took ſeveral towns from the Latins, and ſo far enlarged his dominions, that, diſdaining the title of *deſpot*, he aſſumed that of *emperor*, and was crowned by Demetrius archbiſhop of Bulgaria. Charles, the laſt prince of this family, dying without lawful iſſue, bequeathed Epirus and Acarnania to his natural ſons, who were driven out by Amurath the ſecond. Great part of Epirus was afterwards held by the noble family of the Caſtriots; who, though they were maſters of all Albania, yet ſtyled themſelves princes of Epirus. Upon the death of the famous George Caſtriot, ſurnamed *Scanderbeg*, Epirus fell to the Venetians, who were ſoon diſpoſſeſſed of it by the Turks; in whoſe hands it ſtill continues, being now known by the name of *Albania*, which comprehends the Albania of the ancients, all Epirus, and that part of Dalmatia which is ſubject to the Turks.

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EPISCOPACY, that form of church-government, in which dioceſan biſhops are eſtabliſhed as diſtinct from and ſuperior to prieſts or preſbyters. We have already obſerved, that it is a long time ſince the miniſters of religion have been diſtinguiſhed into different orders, and that it has been much controverted whether the diſtinction be of divine or human right; whether it was ſettled in the apoſtolic age or afterwards. (See BISHOP.) This controverſy commenced ſoon after the Reformation; and has been agitated with great warmth between the *Epiſcopalians* on the one ſide, and the *Preſbyterians* and *Independents* on the other. Among the proteſtant churches *abroad*, thoſe which were reformed by *Luther* and his aſſociates are in general *epiſcopal;* whilſt ſuch as follow the doctrines of *Calvin* have for the moſt part thrown off the order of biſhops as one of the corruptions of popery. In *England*, however, the controverſy has been conſidered as of greater importance than on the *Continent:* for it has there been ſtrenuouſly maintained by one party, that the *epiſcopal order* is eſſential to the conſtitution of the church; and by others, that it is a pernicious encroachment on the rights of men, for which there is no authority in ſcripture. Though the queſtion has for ſome time lain almoſt dormant, and though we have no deſire to revive it; yet as a work of this kind might perhaps be deemed defective, did it contain no account whatever of a controverſy which has employed ſome of the ableſt writers of the paſt and preſent centuries, we ſhall give a fair though ſhort view of the chief arguments, by which the advocates of each contending party have endeavoured to ſupport their own cauſe, leaving our readers to judge for themſelves where the truth lies. See INDEPENDENTS and PRESBYTERIANS.

Epiſcopacy.

2
The Independent ſcheme.

The *Independent* maintains, that under the goſpel diſpenſation there is nothing which bears the ſmalleſt reſemblance to an excluſive prieſthood; that Chriſt and his apoſtles conſtituted no permanent order of miniſters in the church; but that any man who has a firm belief in revelation, a principle of ſincere and unaffected piety, a capacity for leading devotion and communicating inſtruction, and a ſerious inclination to engage in the important employment of promoting the everlaſting ſalvation of mankind; is to all intents and purpoſes a regular miniſter of the New Teſtament, eſpecially if he have an invitation to the paſtoral office from ſome particular ſociety of Chriſtians.

3
Epiſcopal arguments againſt it.

Againſt this ſcheme, which ſuppoſes the rights of Chriſtians all equal and common, and acknowledges no authority in the church except what may be derived from the election of her members, the Proteſtant Epiſcopalian reaſons in the following manner He admits, as an undoubted truth, that our bleſſed Lord gave to none of his immediate followers authority or juriſdiction of ſuch a nature as could interfere with the rights of the civil magiſtrate, for all ſuch authority was diſclaimed by himſelf: " My kingdom (ſaid he to Pilate) is not of this world:" and to a certain perſon who aſked him to decide a queſtion of property between him and his brother, he replied, " Man, who made me a judge or a divider over you?" But when it is conſidered, that Chriſt came into this world to " turn men from darkneſs to light, and from the power of Satan to the living God; that he gave himſelf for us, that he might redeem us from all iniquity, and purify to himſelf a peculiar people zealous of *good works;*" that of theſe works many are ſuch as unregenerate humanity has no inclination to perform, and that the doctrines which he revealed are ſuch as human reaſon could never have diſcovered; the advocate for epiſcopacy thinks it was extremely expedient, if not abſolutely neceſſary, that, when he aſcended into heaven, he ſhould eſtabliſh upon earth ſome authority to illuſtrate the revelation which he had given, and to enforce obedience to the laws which he had enacted. There is nothing, continues he, more ſtrictly required of Chriſtians, than that they live together in unity, profeſſing the ſame faith, joining in the ſame worſhip, and practiſing the ſame virtues. But as men have very different paſſions, prejudices, and purſuits, ſuch unity would be impoſſible, were they not linked together in *one ſociety* under the government of perſons authoriſed to watch over the purity of the faith, to preſcribe the forms of public worſhip, and to explain the nature and inculcate the neceſſity of the ſeveral virtues. The ſociety of Chriſtians, in reſpect of its unity and organization, is compared to the human body: for " as we have many members in one body, and all members have not the ſame office; ſo we being many are one body in Chriſt, and every one members one of another," (Rom. xii. 4, 5.) It is called the *church*, the *kingdom of heaven*, and

4
Chriſtians linked together in one ſociety called the *church*, the *kingdom of heaven*, and the *kingdom of God*.

and

and *the kingdom of God*; and its affairs, like thoſe of every other kingdom, are adminiſtered by proper officers in ſubordination to the ONE LORD, who, "when he aſcended up on high, and led captivity captive, gave ſome apoſtles, and ſome prophets, and ſome paſtors and teachers, for the perfecting of the ſaints, for the work of the miniſtry, for the edifying of the body of Chriſt:" (Epheſ. iv. 8—13.) That thoſe various orders of miniſters were veſted with real authority in the church, might be inferred from principles of reaſon as well as from the dictates of revelation. A ſociety without ſome ſort of government, government without laws, or laws without an executive power, is a direct abſurdity.

5
The church governed by proper officers.

Where there are laws, ſome muſt govern, and others be governed; ſome muſt command, and others obey; ſome muſt direct, and others ſubmit to direction. This is the voice of *nature*; it is likewiſe the language of *ſcripture*. "Obey them (ſays the inſpired author of the epiſtle to the Hebrews) who have the rule over you, and ſubmit yourſelves: for they watch for your ſouls as they that muſt give account." A text which ſhows that the authority of the miniſters of religion was diſtinct from that of the civil magiſtrate, whoſe duty is to watch, *not for the ſouls*, but for the *lives* and *properties*, of his ſubjects.

6
All Chriſtians required to be members of the church.

Of the ſociety thus conſtituted, it was not, as of a philoſophical ſect, left to every man's *choice* whether or not he would become a member. All who embrace the faith of the Redeemer of the world are required to be *baptized*, under the pain of forfeiting the benefits of redemption: but one great purpoſe for which baptiſm was inſtituted, is to be the rite of initiation into the church of Chriſt; "for by one ſpirit are we all baptized into one body, whether we be Jews or Gentiles, whether we be bond or free," (1 Cor. xii. 13.) Of baptiſm, whatever be the importance, it is evident, that to receive it, is not, like the practice of juſtice, or the veneration of the Supreme Being, a duty reſulting from the relations of man to his Creator and fellow-creatures; that its whole efficacy, which in ſcripture is ſaid to be nothing leſs than the remiſſion of ſins, is derived from *poſitive inſtitution*; and therefore, that the *external rite* can be of no avail, but when it is adminiſtered in the *manner preſcribed*, and by a perſon *authoriſed* to adminiſter it.

7
All Chriſtians not authoriſed to adminiſter the ſacraments.

That *all* Chriſtians are not veſted with this authority, as one of the common privileges of the faith, appears from the commiſſion which our Saviour after his reſurrection gave to his apoſtles. At that period, we are aſſured that the number of his followers was not leſs than *five hundred*; yet we find, that to the *eleven diſciples* only did "he come and ſpeak, ſaying, All power is given unto me in heaven and in earth; go ye, therefore, and teach all nations, baptizing them in the name of the Father, and of the Son, and of the Holy Ghoſt."

Of the 500 diſciples there is ſurely no reaſon to believe that there were not *many* well qualified to inſtruct either a Jew or a Gentile in the doctrines of the goſpel; and it is certain, that *any one* of them could have waſhed his convert with water in the name of the Holy Trinity as well as St Peter or St John: but ſuch an unauthoriſed waſhing would not have been Chriſtian baptiſm, nor of equal validity with it, any more than the opinion of a lawyer at the bar is the judgment of a court of juſtice, or of equal obligation. It is the commiſſion of the ſovereign which gives force to the judgement of the court; it is the commiſſion of Chriſt which gives validity to baptiſm. The ſame reaſoning is applicable to the Lord's ſupper, which, if it be not adminiſtered by thoſe who have authority for ſuch adminiſtration, cannot be deemed a ſacrament of Chriſt's inſtitution.

Theſe two rites are the external badges of our profeſſion. By the *one*, we are incorporated into that ſociety of which our Redeemer is the head and ſovereign: in the celebration of the *other*, we have a right to join, whilſt of that ſociety we continue members. But if by an open and ſcandalous diſregard of the precepts of the goſpel, we ſhould prove ourſelves unworthy of its privileges, the ſame perſons who are authoriſed to admit us into the church, are likewiſe veſted with authority to caſt us out of it; for to them were given "the keys of the kingdom of heaven (or the church), with aſſurance, that whatſoever they ſhould bind on earth, ſhould be bound in heaven; and whatſoever they ſhould looſe on earth, ſhould be looſed in heaven," (Mat. xviii. 18.) As baptiſm is to be adminiſtered ſo long as there ſhall be perſons to be enliſted under the banners of Chriſt, and the Lord's Supper to be celebrated ſo long as it ſhall be the duty of ſoldiers to adhere to the ſtandard of their leader and their head; and as it is likewiſe to be feared that there will never come a time when all Chriſtians ſhall "walk worthy of the vocation wherewith they are called;" it follows, that this *power of the keys* which was originally given to the apoſtles, muſt continue in the church through all ages, even unto the end of the world.

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But as we have ſeen, that it was not at firſt intruſted to *all* the diſciples in common, as one of the privileges inſeparable from their profeſſion, and as no body of men can poſſibly *transfer* an authority of which they themſelves were *never poſſeſſed*; it is certain, that even now it cannot, by the election of one claſs of Chriſtians, be delegated to another, but muſt, by ſome mode of ſucceſſion, be derived from the apoſtles, who were ſent by Chriſt as he was ſent by his Father. To argue from the origin of *civil* to that of *eccleſiaſtical* government, although not very uncommon, the Epiſcopalian deems extremely fallacious. Of the various nations of the world, many of the ſovereigns may indeed derive their authority from the ſuffrages of their ſubjects; becauſe in a ſtate of nature, every man has an inherent right to defend his life, liberty, and property; and what he poſſeſſes in his own perſon, he may for the good of ſociety transfer to another: but no man is by *nature*, or can *make himſelf*, a member of the Chriſtian church; and therefore authority to govern that ſociety can be derived only from him by whom it was founded, and who died that he might "gather together in one all the children of God."

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Againſt ſuch reaſoning as this it hath been urged, that to make inſtitutions, which like baptiſm and the Lord's ſupper are generally neceſſary to the ſalvation of *all* Chriſtians, depend for their efficacy upon the authority or commiſſion of a *particular order*, appears inconſiſtent with the wiſdom and goodneſs of God; as by ſuch an economy an intolerable domination would be eſtabliſhed over the ſouls of men, and the purpoſe for which the Saviour of the world died might be in ſome degree defeated by the caprice of an ignorant and arbitrary prieſthood. The objection is certainly plauſible; but the Epiſcopalian affirms, that either it has no weight, or militates with equal force againſt all religion, natural as well as revealed, and even againſt the wiſdom of Providence in the government of this world.—In every thing, he obſerves, relating to their temporal and to their ſpiritual intereſts, mankind are all ſubjected to mutual dependence. The rich depend upon the poor, and the poor upon the rich. An infant neglected from the birth, would barely cry and ceaſe to live; nor is it eaſily to be conceived, that in the more rigid climates of the earth, a full grown man could provide even the neceſſaries of mere animal life. Of religion, it is certain that in ſuch a ſtate nothing could be known; for there is not the ſmalleſt reaſon to imagine that any individual of the human race—an *Ariſtotle*, a *Bacon*, or a *Newton*, had he been left alone from his infancy, without culture and without education,—could ever, by the native vigour of his own mind, have diſcovered the exiſtence of a God, or that ſuch ſpeculations as lead to that diſcovery would have employed any portion of his time or his thoughts. Even in civilized ſociety it would be impoſſible, in the preſent age, for any man, without the aſſiſtance of others, to underſtand the very firſt principles of our common Chriſtianity; for the ſcriptures, which alone contain thoſe principles, are written in languages which are now no where vernacular. In the fidelity of tranſlators, therefore, every illiterate diſciple of Jeſus *muſt* confide, for the truth of thoſe doctrines which conſtitute the foundation of all his hopes; and as no man ever pretended that the Chriſtian *ſacraments* are more neceſſary to ſalvation than the Chriſtian *faith*, the Epiſcopalian ſees no impropriety or inconſiſtency in making thoſe perſons receive baptiſm and the Lord's ſupper by the miniſtration of others, who by ſuch miniſtration muſt of neceſſity receive the truths of the goſpel.

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By ſuch arguments as theſe does the Epiſcopalian endeavour to prove that Chriſt conſtituted ſome *permanent order of miniſters* in the church, to whom in the externals of religion the great body of Chriſtians are commanded to pay obedience; and thus far the Preſbyterian agrees with him: but here their agreement ends. They hand in hand attack the Independent with the ſame weapons, and then proceed to attack each other. The *one* maintains, that originally the officers of the Chriſtian church were all *preſbyters* or *elders* of *one order*, and veſted with *equal powers;* whilſt the *other* holds, that Chriſt and his apoſtles appointed *divers orders* of miniſters in the church; that of theſe orders the higheſt alone was empowered to ordain others; and that therefore obedience, as to thoſe who watch for our ſouls, can be due only to ſuch as are *epiſcopally ordained*.

12
Preſ-
rian

In behalf of the Preſbyterian plea it is urged, that the titles of *biſhop* and *preſbyter*, being in the New Teſtament indifferently given to the ſame perſons, cannot be the titles of diſtinct eccleſiaſtical officers; which appears ſtill more evident from the ordination of *Timothy*, who, although he was the firſt *biſhop* of Epheſus, received his epiſcopal character by the impoſition of the hands of the *preſbytery*.—That one and the ſame man is, in the New Teſtament, ſtyled ſometimes a *biſhop* and ſometimes a *preſbyter*, cannot be denied; but although every apoſtolic biſhop was therefore undoubtedly a preſbyter, it does not of courſe follow, ſays the Epiſcopalian, that every preſbyter was likewiſe a biſhop. In the *Old* Teſtament, Aaron and his ſons are without any diſcrimination of order frequently ſtyled *prieſts;* and in the *New*, both St Peter and St John call themſelves *preſbyters*, as St Paul, upon one occaſion, ſtyles himſelf a *deacon*—διακονος, (Eph. iii. 7.): yet no man ever ſuppoſed thoſe apoſtles to have been ſuch eccleſiaſtical officers as modern preſbyters and deacons; and it is univerſally known that in the Jewiſh prieſthood there were different orders, and that Aaron was of an order ſuperior to his ſons. This being the caſe, the preſbyters, by the laying on of whoſe hands Timothy was made a biſhop, *may have been* of the ſame order with St Peter and St John; and if ſo, it follows that his ordination was *epiſcopal*. At all events, we are certain, continues the advocate for Epiſcopacy, that it was not, in the modern ſenſe of the word, *Preſbyterian;* for the gift, which in the firſt epiſtle is ſaid to have been "given by prophecy *with* the laying on of the hands of the preſbytery," is in the ſecond ſaid to have been "in him *by* the putting on of the hands of St Paul." And here it is worthy of obſervation, that the prepoſition uſed in the former caſe is μετα which ſignifies *concurrence* rather than inſtrumentality; but *that* in the latter is δια, which, as every Greek ſcholar knows, is prefixed to the *inſtrumental cauſe* by which any thing is effected: ſo that whatever may have been the order of the preſbyters who *concurred*, St Paul appears to have been the *ſole* ordainer. But by the confeſſion of all parties, St Paul was a biſhop in the higheſt ſenſe in which that word is ever uſed; and the powers of the epiſcopate not being parcelled out among various partners, of whom each poſſeſſes only a ſhare, the impoſition of his hands was ſufficient for every purpoſe which could have been effected by the hands of the whole college of apoſtles.

13
Epiſcopal
arguments
againſt it.

It appears, therefore, that from the promiſcuous uſe of the titles *biſhop* and *preſbyter*, and from the *ordination of Timothy*, nothing can with certainty be concluded on either ſide of this celebrated queſtion. But if, inſtead of reſting in mere *words*, which, when taken alone and without regard to the context, are almoſt all of ambiguous ſignification, we attend to ſome important *facts* recorded in the New Teſtament, the Epiſcopalian thinks we ſhall in them diſcover ſufficient evidence that the goverment of the primitive church was prelatical.

14
Three orders of Chriſtian miniſters during our Saviour's ſtay upon earth; and likewiſe after his aſcenſion into heaven.

During our Saviour's ſtay upon earth, it is undeniable that he had under him two diſtinct orders of miniſters—the twelve, and the ſeventy; and after his aſcenſion, immediately before which he had enlarged the powers of the *eleven*, we read of *apoſtles*, *preſbyters*, and *deacons*, in the church. That the preſbyters were ſuperior to the deacons, and the apoſtles ſuperior to both, is univerſally acknowledged; but it has been ſaid that in ſcripture we find no intimation that the apoſtolic order was deſigned for continuance. A Quaker ſays the ſame thing of water-baptiſm; and the Epiſcopalian obſerves, that it would be difficult to point out by what paſſage of ſcripture, or what mode of reaſoning, thoſe who, upon this plea, reject the apoſtolic order of Chriſtian miniſters, could overthrow the principles upon which the diſciples of *George Fox* reject the uſe of that rite which our Saviour inſtituted for the initiation of mankind into his church. They were the *eleven* alone to whom Chriſt ſaid, "Go ye therefore and teach all nations, baptizing them in the name of the Father, and of the Son, and of the Holy Ghoſt:" and therefore, although we frequently find preſbyters and deacons adminiſtering the ſacrament of baptiſm, we muſt conclude, that as a *judge* adminiſters juſtice by authority derived from his *ſovereign*, ſo thoſe *inferior officers* of the church adminiſtered baptiſm by authority derived from the *apoſtles*. Indeed, had they pretended to act by any other authority, it is not eaſily to be conceived how *their* baptiſm could have been the baptiſm inſtituted by Chriſt; for it was not with the *external waſhing* by whomſoever performed, but with the *eleven* and their ſucceſſors, that he promiſed to be "always, even unto the end of the world."

15
The apoſtolic or higheſt order deſigned to be permanent.

That the *eleven* did not conſider this promiſe, or the commiſſion with which it was given, as terminating with their lives, is evident from their admitting others into their own order; for which they had competent authority, as having been ſent by Chriſt as he was ſent by his Father. When St Paul, to magnify his office and procure to it from the Galatians due reverence, ſtyles himſelf, "an apoſtle not of men, neither by man, but by Jeſus Chriſt and God the Father," he muſt have known ſome who derived their apoſtolic miſſion *by man;* otherwiſe he could with no propriety have claimed particular reſpect, as he evidently does, from what was in his own apoſtleſhip no particular diſtinction. At that very early period, therefore, there muſt have been in the church *ſecondary* apoſtles, if they may be ſo called, upon whom, by impoſition of hands, or by ſome other ſignificant ceremony, the eleven had conferred that authority which was given to them by their Divine Maſter. Such were *Matthias* and *Barnabas;* ſuch likewiſe were *Timothy*, *Titus*, and the *angels* of the ſeven churches in Aſia, with many others whoſe names and offices are mentioned in the New Teſtament.

16
Matthias, Barnabas, Timothy, Titus, and the angels of the ſeven churches in Aſia, *biſhops*.

That *Matthias* and *Barnabas* were of the apoſtolic order, has never been controverted; and that *Timothy* and *Titus* were ſuperior to modern preſbyters, is evident from the offices aſſigned them. Timothy was, by St Paul, empowered to *preſide* over the preſbyters of Epheſus, to receive accuſations againſt them, to *exhort*, to *charge*, and even to *rebuke* them; and Titus was, by the ſame apoſtle, left in Crete for the expreſs purpoſe of ſetting things in order, and ordaining *preſbyters* in *every* city. To *exhort*, to *charge*, and with authority to *rebuke* one's equal, is certainly incongruous; and therefore the Epiſcopalian thinks the powers conferred on Timothy altogether inconſiſtent with that parity of order and of office for which his antagoniſts ſo ſtrenuouſly plead. Even the commiſſion given to Titus appears in his eyes by much too extenſive for a Preſbyterian miniſter, who, after having ordained in *one* city, could not have proceeded to ordain in *another* without the conſent and aſſiſtance of his brother and fellow-labourer. With reſpect to the *angels* of the Aſiatic churches, he obſerves, that in the Old Teſtament the title of *angel* is ſometimes given to the *Jewiſh high-prieſt*, and particularly by the prophet Malachi, who calls him "the *meſſenger* (αγγελος) of the Lord of Hoſts;" and that the *angels* of the churches mentioned by St John, were *Chriſtian high prieſts*, or *biſhops* preſiding over more than one congregation, as it is affirmed by all the ancient writers, cannot, he thinks, be denied by any man who will take the trouble to compare ſcripture with ſcripture. We read (Acts xix. 10, and 20.), that "in the ſpace of two years *all they* who dwelt in Aſia heard from St Paul the word of the Lord Jeſus, both Jews and Greeks; and that there the word of God *grew mightily* and *prevailed:*" but with what truth or propriety could this have been ſaid, if at the time of St John's writing the Apocalypſe, which was 30 years after St Paul's death, all the Chriſtians of Proconſular Aſia were compriſed in *ſeven congregations*, which aſſembled, each with its proper paſtor, to perform, in *one place*, the duties of public worſhip? In a word, the advocate for epiſcopacy inſiſts, that no man, who reads without prejudice the acts of the apoſtles, the epiſtles of St Paul, and the Apocalypſe of St John, can ſeriouſly believe that *Timothy*, *Titus*, *Epaphroditus*, *Soſthenes*, and *Silvanus*, with the *angels* of the ſeven churches in Aſia, were *mere preſbyters*, or that the government of the church was, in thoſe days, by a college of elders.

When from the inſpired penmen of the New Teſtament he proceeds to examine the ſucceeding writers of the Chriſtian church, the Epiſcopalian finds ſuch multiplied and concurring evidence of the apoſtolic inſtitution of epiſcopacy, as he thinks it impoſſible to reſiſt without denying the truth of all ancient hiſtory, and even ſhaking the pillars of revelation itſelf; for "in the noble army of martyrs," the witneſſes of the epiſcopal government of the church are earlier, and by far more numerous, than thoſe who teſtify that the *goſpel* of *St Matthew* was written by that apoſtle, or that the book of the *Apocalypſe* is canonical ſcripture. The authority of the *fathers* indeed is at preſent very low; but ſhould they be allowed to be as fanciful divines and as bad critics as their worſt enemies are pleaſed to repreſent them, this would detract nothing from their evidence when they bear witneſs to the conſtitution of the church in their own times; for of their *integrity* there can be no doubt: and what the Epiſcopalian wants of them is only their teſtimony to matters of fact which fell under the cognizance of their own ſenſes, and about which therefore they could not be deceived. It is here indeed chiefly that he triumphs over his antagoniſts. In the ſecond and third centuries there was no general council, nor any Chriſtian ſovereign. A prelacy therefore, he urges, could not have been *univerſally* introduced, during that period, either by a concert among the clergy, or by the authority of the civil magiſtrate. Yet that even *then* there was no church under heaven, of which the government was not epiſcopal, has been confeſſed by ſome of the moſt learned writers among the Preſbyterians themſelves; whence he concludes that epiſcopacy is of divine inſtitution.

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The candid Epiſcopalian, however, allows, that in the apoſtolic age there may have been ſome churches which at firſt had only biſhops and deacons to perform the offices of religion; for when the number of diſciples in any place was ſo ſmall that they could all meet in one aſſembly, there was no neceſſity for any other order of miniſters: but it appears that, from the very *beginning*, *biſhops*, *preſbyters*, and *deacons*, were ſettled in

all

ſcopacy.

all the *larger* cities of the Roman empire; and it was in thoſe days an allowed maxim, that without a *biſhop* there could be *no church*. The better to underſtand the original ſtate and inſtitution of epiſcopacy, it is neceſſary to obſerve, that the empire, which contained almoſt all the known part of the Chriſtian world, was by Auguſtus Cæſar divided into provinces, ſubjected each to the authority of one chief magiſtrate, who was commonly a *prætor* or *proconſul*, and who reſided in the metropolis or chief city of the province. A province comprehended the cities of a whole region; and in the age of the apoſtles, each city was under the immediate government of certain magiſtrates within its own body, known by the name of βουλη, or *ſenatus*, *ordo* and *curia*, "the ſtates and court of the city." Thoſe magiſtrates were ſubordinate to the *prætor* or *proconſul*: but among them there was *one* ſuperior to the reſt, called ſometimes *dictator*, and ſometimes *defenſor civitatis*, whoſe juriſdiction extended not only over the city itſelf, but likewiſe over all the adjacent territory. That territory was denominated προαστεια, or the ſuburbs, and often reached to the diſtance of 10 or 12 miles round the city, and ſometimes much farther, containing within it many villages and ſmall towns under the government of the city magiſtrates.

18
origin
ioceſes.

From ſome paſſages in the New Teſtament, and from the concurring evidence of the earlieſt writers of the church, it appears to have been the purpoſe of the apoſtles to ſettle a biſhop in *every* city where there was a civil magiſtracy: but as they could not be perſonally preſent in all places at once, it was natural for them to *enter* upon the great work of converting the nations, by *firſt* preaching the goſpel in that city of each province which was the ordinary reſidence of the governor; becauſe to it there muſt have been the greateſt reſort of people, who would carry the glad tidings with them into the country when they returned. Accordingly, having diſperſed themſelves over the empire, and made numbers of proſelytes in the principal cities, they fixed in each, where they ſaw it neceſſary, a *biſhop*, with a college of *preſbyters* and *deacons*; and gave to thoſe biſhops, who were at firſt called *apoſtles*, a commiſſion, as the *other* cities of the province ſhould be converted, to fix in them biſhops alſo.

In ſome of the ſmaller cities, it is extremely probable that a biſhop and a deacon were for a ſhort time the only eccleſiaſtical officers, till the number of Chriſtians increaſed ſo much as to make it impoſſible for them all to aſſemble in one houſe for the purpoſes of public worſhip. The biſhop then ordained *preſbyters* to officiate in thoſe congregations where he himſelf could not be preſent, and to aſſiſt him in other parts of his paſtoral office; but in all their miniſtrations the preſbyters were ſubordinate to him, who was the chief paſtor within the city, who compoſed the prayers which were offered up in public, and to whom all the other miniſters of religion were accountable for their conduct. So long as the number of the faithful was confined within the *walls* of the city, it appears that the biſhop with his preſbyters and deacons lived together as in a college; that divine ſervice was every Lord's-day, or oftener, performed in what was afterwards called the cathedral or mother-church, by the biſhop himſelf, aſſiſted by ſome of his clergy; and that the congregations which met in other churches, having no *fixed* paſtors, were ſupplied by ſuch preſbyters as the biſhop choſe to ſend to them from his own church. Whilſt matters continued in this ſtate, the clergy had no other revenues than what aroſe from the voluntary oblations of the people; which were indeed ſo large as not only to ſupport them with decency, but likewiſe to anſwer other ends of charity and munificence. They were commonly divided into four equal parts; of which one was allotted to the biſhop, a ſecond to the inferior clergy, a third to the poor, and a fourth to keep the churches in repair; and it was conſidered as part of the biſhop's duty to take care that the offerings ſhould be faithfully applied to theſe purpoſes.

Epiſcopacy.

19
The origin of pariſhes.

When converts increaſed in number, and churches were built in the ſuburbs, each of thoſe churches had a fixed paſtor ſimilar to a pariſh-prieſt among us; but ſtill thoſe paſtors, as well as the city-clergy, miniſtered in ſubordination to the biſhop, whoſe authority extended as far as the civil authority of the Roman magiſtrate, within which diſtrict or dioceſe it was ſupreme over all orders of Chriſtians. This every man knows who is acquainted with eccleſiaſtical hiſtory; for the biſhop alone could ordain *prieſts* and *deacons*, adminiſter the rite of *confirmation*, *abſolve penitents* who were under church-cenſure, and *exclude from communion* heretics and notorious offenders; and from his ſentence there lay no appeal but to a ſynod of comprovincial biſhops.

20
The origin of metropolitans or archbiſhops.

Such ſynods were in each province convened by the biſhop of the chief city; for the apoſtles having been careful to place in thoſe cities men of the moſt eminent gifts and abilities, the other biſhops of the provinces applied to them for advice upon every emergency, and paid a particular deference to them upon every occaſion. So that though all biſhops were of equal authority as *biſhops*, yet when they met to conſecrate a new biſhop, or to deliberate upon the affairs of the church, they yielded a precedency to the biſhop of the metropolis, who called them together, and who ſat as *preſident* or *moderator* of the ſynod. Hence the origin of metropolitans or *archbiſhops*; whoſe authority was ſo conſiderable, that though there is not a doubt but the *election* of biſhops was anciently placed in the clergy and people of the vacant dioceſe, yet the biſhop *elect* could not be *conſecrated* without the conſent of the archbiſhop of the province.

In conſequence of the extenſive powers with which the primitive biſhops were veſted, they are commonly ſtyled in the writings of thoſe times *preſidents*, *provoſts*, or *inſpectors* of the church, *chief prieſts*, *princes of the clergy*, and even *princes of the people*; but their authority was wholly ſpiritual. Thoſe prelates, imitating the example of their Divine Maſter when on earth, neither poſſeſſed nor aſſumed to themſelves any juriſdiction over the *properties* or *civil rights* of men. In conſequence of St Paul's having reprimanded the Corinthians for going to law before the *unbelievers*, they were indeed often choſen as *arbiters* of ſuch civil diſputes as aroſe between individuals under their epiſcopal government; but on theſe occaſions they could not act unleſs the ſubmiſſion was *voluntarily* made by *both* the contending parties, and *then* their deciſion was final. When the empire became Chriſtian, this privilege was confirmed to them by law; for any *civil* cauſe depending before a court of juſtice could be withdrawn, and by the mutual conſent of parties be ſubmitted to the arbitration of the biſhop, whoſe award, which in former times could be enforced only by the terror of church-cenſures, was then enforced by the ſecular magiſtrate. In *criminal* cauſes, where the trial might be for life or death, they were prohibited both by the canons of the church and by the laws of the ſtate from acting as judges; and therefore they never ſuffered ſuch cauſes to come before them, except when it was neceſſary that the perſon accuſed, if found guilty, ſhould be excluded from the communion of the faithful. But they had ſo many civil cauſes flowing in upon them, that they were ſoon obliged to devolve part of that care upon other perſons in whoſe knowledge, prudence, and integrity, they could fully confide; and as the perſons employed to act in the biſhop's ſtead were often *laymen*, it has been conjectured that they gave riſe to the office of *lay-chancellor* in the church, and to all that train of ſpiritual judges and ſpiritual courts againſt which ſuch numbers are diſpoſed to clamour.

21
The probable origin of ſpiritual courts.

22
Biſhops had no civil rank till after the ſubverſion of the Roman empire and the converſion of the Gothic nations.

Be this as it may, it is certain that, through the piety and munificence of the Chriſtian emperors, the biſhops enjoyed large revenues and many valuable privileges; but it does not appear that they had any rank or authority, as *barons* or *temporal princes*, till the Gothic nations, which ſubverted the Roman empire, had embraced the Chriſtian faith. As Chriſtianity incapacitated the leaders of thoſe tribes from officiating as chief prieſts at the religious rites which were uſually celebrated at the opening of their public aſſemblies, the biſhops came naturally to diſcharge that duty on ſuch occaſions, when they muſt have ſhared in the rank by ſharing in the functions of the chief. The ſituation in which they thus appeared at the opening of all political conventions, would enable them to join with much effect in the deliberations which enſued; and their ſuperior knowledge, their ſacred character, and their influence with the people, would ſoon acquire them power equal to their rank. They muſt therefore have been well intitled to demand admiſſion into that council which was formed by the king and the lay-chiefs at the national aſſemblies: and as they balanced the authority of thoſe chiefs, we cannot doubt that the king would be diſpoſed to give the utmoſt effect to their claim. Accordingly, we find the dignified clergy, who received large grants of land to be held on the ſame tenures with the lands of the lay magiſtrates, preſiding along with thoſe magiſtrates in the provincial aſſemblies of every degree in all the Gothic nations, and enjoying every advantage in point of rank and authority in their national diets. Hence the biſhop of Rome, and ſeveral biſhops in Germany, have, like the dukes and marquiſes of that empire, been for a long time ſovereign princes; and hence too the biſhops of England and Ireland have always ſat, and have an equal right with the lay-peers to ſit, in the upper houſe of parliament. It is however obvious, that, ſo far as epiſcopacy is of *apoſtolical* inſtitution, thoſe peers and princes poſſeſs not the *original* character in any higher degree than the biſhops in America, who are barely tolerated, or than thoſe in Scotland who do not enjoy that privilege; and that confirmation adminiſtered, or holy orders conferred, by a perſecuted prelate, muſt be as effectual to the purpoſes of religion, as if given by a German prince or an Engliſh peer.

In this ſhort view of epiſcopacy, it has been our endeavour to do juſtice to the ſubject, without ſuffering ourſelves to be influenced by partiality or prejudice. As we are not ourſelves epiſcopalians, we have advanced nothing of our own; but have ſelected from Engliſh writers, who have at different times undertaken to defend the *divine right* of epiſcopacy, ſuch facts and arguments as to us appear to be of the moſt importance, or to have the greateſt weight, without remarking upon them, or offering any anſwer. The reaſoning employed to prove that the order of biſhops was inſtituted by the apoſtles, is taken from a work prepared for the preſs by Dr Berkeley prebendary of Canterbury, and ſon of the celebrated biſhop of Cloyne. For the reſt of the detail, we are indebted chiefly to Bingham's *Origines Eccleſiaſticæ;* a performance in great eſtimation with thoſe Engliſh divines who are commonly known by the appellation of *high churchmen*. As editors of a work of this kind, it is not *our* buſineſs to be of *any party*, or to ſupport, in oppoſition to all others, a *particular* church, though that church ſhould be our own: We ſhall therefore treat *independency* and *preſbytery* as we have treated *epiſcopacy*, by employing ſome able writer of each ſociety to plead his own cauſe. Mean while, we ſhall conclude this article with a few reflections, which, though they come from the pen of an obſcure author, deſerve to be engraved deep in the memory of every controvertiſt of every communion.

23
Moderation in controverſy recommended.

"On complicated queſtions (ſays a late apologiſt for the epiſcopal church in Scotland), men will always differ in opinion; but conſcious each of the weakneſs of his own underſtanding, and ſenſible of the bias which the ſtrongeſt minds are apt to receive from thinking long in the ſame track, they ought to differ with charity and meekneſs. Since unhappily there are ſtill ſo many ſubjects of debate among thoſe who name the name of Chriſt; it is doubtleſs every man's duty, after diveſting himſelf as much as poſſible of prejudice, to inveſtigate thoſe ſubjects with accuracy, and to adhere to that ſide of each diſputed queſtion which, after ſuch inveſtigation, appears to him to be the truth: but he tranſgreſſes the favourite precept of his divine Maſter, when he caſts injurious reflections, or denounces anathemas, upon thoſe who, with equal ſincerity, may view the matter in a different light; and by his want of charity does more harm to the religion of the *Prince of Peace*, than he could poſſibly do good, were he able to convert all mankind to his own orthodox opinions."

EPISCOPAL, ſomething belonging to Bishops.

EPISCOPALIANS, in church-hiſtory, an appellation given to thoſe who prefer the epiſcopal government and diſcipline to all others. See Episcopacy.

By the teſt act, none but Epiſcopalians, or members of the church of England, are qualified to enjoy any office civil or military.

EPISCOPIUS (Simon), one of the moſt learned men of the 17th century, and the chief ſupporter of the Arminian ſect, was born at Amſterdam in 1583. In 1612, he was choſen divinity profeſſor at Leyden, in the room of Gomarus, who reſigned; and the functions of his office, with his private ſtudies, were light burdens to him, compared with the difficulites he ſuſtained on account of the Arminian controverſy: which, though it began in the univerſities, ſoon flew to the pulpits,

pulpits, from whence it ſpread and inflamed the people. The ſtates of Holland having invited Epiſcopius to take his place at the ſynod of Dort, he went thither accompanied by ſome remonſtrant miniſters; but the ſynod would not allow them to ſit as judges, nor to appear in any other capacity than as perſons ſummoned before them: they ſubmitted, were depoſed from their functions, and baniſhed the territories of the commonwealth. Epiſcopius and his perſecuted brethren retired to Antwerp; but the times growing more favourable, he returned to Holland in 1626, and was made miniſter of the church of the Remonſtrants at Rotterdam: in 1634, he was choſen rector of the college founded by his ſect at Amſterdam, where he ſpent the remainder of his days. He died in 1643, of the ſame diſorder which had killed his wife before, a retention of urine; having loſt his ſight ſome weeks previous to his end. The learned have beſtowed great eulogiums on Epiſcopius; but he did not always write with that moderation which might have been wiſhed. His works make two volumes in folio, of which the ſecond conſiſts of poſthumous publications.

EPISCOPUS, the ſame with biſhop. See Bishop and Episcopacy.

EPISODE, in poetry, a ſeparate incident, ſtory, or action, which a poet invents, and connects with his principal action, that his work may abound with a greater diverſity of events; though, in a more limited ſenſe, all the particular incidents whereof the action or narration is compounded, are called *epiſodes*. See Poetry.

EPISPASTIC, in medicine, a topical remedy, which being applied to the external parts of the body, attracts the humours to that part.

EPISTATES, in the Athenian government, was the preſident of the proedri. See Proedri.

EPISTEMONARCH, in the ancient Greek church, an officer of great dignity, who had the care of every thing relating to faith, in the quality of cenſor. His office anſwered pretty nearly to that of maſter of the ſacred palace at Rome.

EPISTLE, denotes the ſame with a miſſive letter; but is now chiefly uſed in ſpeaking of ancient writings, as the epiſtles of St Paul, epiſtles of Cicero, epiſtles of Pliny, &c.

*Epistles and Goſpels*, in the liturgy of the church of England, are ſelect portions of ſcripture, taken out of the writings of the evangeliſts and apoſtles, and appointed to be read, in the communion-ſervice, on Sundays and holidays. They are thought to have been ſelected by St Jerom, and by him put into the lectionary. It is certain, they were very anciently appropriated to the days whereon we now read them, ſince they are not only of general uſe throughout the weſtern church, but are alſo commented upon in the homilies of ſeveral ancient fathers, which are ſaid to have been preached upon thoſe very days to which theſe portions of ſcripture are now affixed.

The epiſtles and goſpels are placed in an admirable order and method, and bear a ſpecial relation to the ſeveral days whereon they are read. The year is diſtinguiſhed into two parts; the firſt being deſigned to commemorate Chriſt's living among us, the other to inſtruct us to live after his example. The former takes in the whole time from Advent to Trinity-Sunday; the latter, all the Sundays from Trinity to Advent. During the firſt of theſe ſeaſons, the epiſtles and goſpels are calculated to raiſe in us a grateful ſenſe of what our Saviour did and ſuffered for us, and ſet before our eyes his nativity, circumciſion, and maniſeſtation to the Gentiles; his doctrines and miracles; his baptiſm, faſting, and temptation; his agony and bloody ſweat; his croſs and paſſion; his death, burial, reſurrection, and aſcenſion; and his miſſion of the Holy Ghoſt. During the ſecond ſeaſon of the year, the epiſtles and goſpels tend to inſtruct us in the true paths of Chriſtianity. See Collects.

EPISTOLARY, ſomething belonging to an epiſtle. See Epistle.

*Epistolary Compoſition.* See Letter; and the article Poetry.

EPISTROPHE. See Oratory, n° 71.

EPISTYLE, in the ancient architecture, a term uſed by the Greeks for what we call *architrave*, viz. a a maſſive piece of ſtone or wood, laid immediately over the capital of a column.

EPITAPH (from επι *upon*, and ταφος *ſepulchre)*, a monumental inſcription, in honour or memory of a perſon deceaſed. It has been diſputed whether the ancient Jews inſcribed epitaphs on the monuments of the dead; but be this as it will, epitaphs it is certain, of very ancient date, are found amongſt them.—The Athenians, by way of epitaph, put only the name of the dead, with the epithet χρηστος, ſignifying "good," or ηρως "hero," and the word χαιρε, ſignifying their good wiſhes: The name of the deceaſed's father and his tribe were frequently added.—The Lacedemonians allowed epitaphs to none but thoſe who had died in battle. The Romans inſcribed their epitaphs to the *manes*, *diis manibus*; and frequently introduced the dead by way of proſopopœia, ſpeaking to the living; of which we have a fine inſtance, worthy the Auguſtan age, wherein the dead wife thus beſpeaks her ſurviving huſband:

*Immatura peri; ſed tu, felicior, annos*
*Vive tuos, conjux optime, vive meos.*

The epitaphs of the preſent day are generally crammed with fulſome compliments which were never merited, characters which human nature in its beſt ſtate could ſcarce lay claim to, and expreſſions of reſpect which were never paid in the life-time of the deceaſed. Hence the proverb with great propriety took its riſe, "He lies like an epitaph."

Epitaph, is alſo applied to certain eloges, either in proſe or in verſe, compoſed without any intent to be engraven on tombs; as, That of Alexander,

*Sufficit huic tumulus, cui non ſufficeret orbis;*

and that of Newton,

*Iſaacum Newton,*
*Quem immortalem*
*Teſtantur Tempus, Natura, Cœlum,*
*Mortalem hoc marmor*
*Fatetur.*

EPITASIS, in ancient poetry, the ſecond part or diviſion of a dramatic poem, wherein the plot, entered upon in the firſt part or *protaſis*, was carried on, heightened, and worked up, till it arrived at its ſtate or height, called *cataſtaſis*.

Epitasis, in medicine, the increaſe of a diſeaſe or beginning of a paroxyſm, particularly in a fever.

EPITHALAMIUM, in poetry, a nuptial ſong or compoſition in praiſe of the bride and bridegroom, praying for their proſperity, for a happy offspring, &c.

Epithalamia were ſung amongſt the Jews, at the door of the bride, by her friends and companions, the evening before the marriage. Pſalm xlv. is an epithalamium. Among the Greeks the epithalamium was ſung as ſoon as the married couple were gone to bed, and attended with ſhouts and ſtamping of the feet to drown the cries of the bride. They returned in the morning, and with the ſame ſong, a little altered, ſaluted them again. The evening ſong was called επιθαλαμια κοιμητικα, the morning ſalute was called επιθαλαμια εγερτικα. This was the practice amongſt the Romans alſo, but their epithalamia were often obſcene.

EPITHEM, in pharmacy, a kind of fomentation, or remedy of a ſpirituous or aromatic kind, applied externally to the regions of the heart, liver, &c. to ſtrengthen and comfort the ſame, or to correct ſome intemperature thereof.

EPITHET, in poetry and rhetoric, an adjective expreſſing ſome quality of a ſubſtantive to which it is joined; or ſuch an adjective as is annexed to ſubſtantives by way of ornament and illuſtration, not to make up an eſſential part of the deſcription. Nothing, ſays Ariſtotle, tires the reader more than too great a redundancy of epithets, or epithets placed improperly; and yet nothing is ſo eſſential in poetry as a proper uſe of them. The writings of the beſt poets are full of them.

EPITOME, in literary hiſtory, the ſame with ABRIDGEMENT.

EPITRITUS, in proſody, a foot conſiſting of three long ſyllables and one ſhort. Of theſe, grammarians reckon four kinds: the firſt conſiſting of an iambus and ſpondee, as ſălūtāntēs; the ſecond, of a trocheus and ſpondee, as cōncĭtātī; the third, of a ſpondee and an iambus, as cōmmūnĭcāns; and the fourth, of a ſpondee and trocheus, as īncāntārĕ. See the articles SPONDEUS, TROCHEUS, &c.

EPITROPE. See ORATORY, n° 83.

EPITROPUS, a kind of judge, or rather an arbitrator, which the Greek Chriſtians under the dominion of the Turks elect in the ſeveral cities, to terminate the differences that ariſe among them, and avoid carrrying them before the Turkiſh magiſtrates. See ARBITRATOR.

Anciently the Greeks uſed the term επιτροπος in the ſame ſenſe as the Latins did *procurator*, viz. for a commiſſioner or intendant. Thus the commiſſioners of proviſions in the Perſian army are called by Herodotus and Xenophon *epitropi*. In the New Teſtament, επιτροπος denotes the ſteward of a houſhold, rendered in the vulgate *procurator*.

EPIZEUXIS. See ORATORY, n° 68.

EPOCHA, in chronology, a term or fixed point of time whence the ſucceeding years are numbered or counted. See ÆRA.

EPODE, in lyric poetry, the third or laſt part of the ode, the ancient ode being divided into ſtrophe, antiſtrophe, and epode. See ODE, &c.

The epode was ſung by the prieſts, ſtanding ſtill before the altar, after all the turns and returns of the ſtrophe and antiſtrophe, and was not confined to any preciſe number or kind of verſes.

The epode is now a general name for all kinds of little verſes that follow one or more great ones, of what kind ſoever they be: and in this ſenſe, a pentameter is an epode after an hexameter. And as every little verſe, which, being put after another, cloſes the period, is called *epode;* hence the ſixth book of Horace's odes is intitled *liber epodon*, "book of epodes," becauſe the verſes are all alternately long and ſhort, and the ſhort ones generally, though not always, cloſe the ſenſe of the long one.

EPOPOEIA, in poetry, the hiſtory, action, or fable, which makes the ſubject of an epic poem. The word is derived from the Greek επος *carmen*, "verſe;" and ποιεω *facio*, "I make."

In the common uſe of the word, however, *epopœia* is the ſame with *epos*, or epic poem itſelf. See the article POETRY.

EPOPS, or HOOPOE. See UPUPA.

EPSOM, a town of Surry, about 16 miles ſouth-weſt from London, long famous for its mineral waters. Theſe were diſcovered in 1618; and though not in ſuch repute as formerly, yet they are not impaired in virtue, and the ſalt * made from them is famous all over Europe, for gently cleanſing and cooling the body. The hall, galleries, and other public apartments, are now run to decay; and there remains only one houſe on the ſpot, which is inhabited by a countryman and his wife, who carry the waters in bottles to the adjacent places, and ſupply the demands of dealers in London. On the neighbouring downs are annually horſe-races; but the inns, ſhops, and bowling-greens are not near ſo much frequented as formerly. The market is on Friday; fair, July 25. The town is about one mile and an half in ſemicircle, from the church to the palace at Durdans, which was burnt down ſome years ſince, but has been rebuilt. It was once inhabited by his preſent majeſty's father. In Hudſon's-Lane here was Epſom-Court, an ancient Saxon ſeat, long ſince converted into a farm. Here are ſo many fields, meadows, orchards, gardens, and the like, that a ſtranger would be at a loſs to know whether this was a town built in a wood, or a wood ſurrounded by a town.

* See *miſtry.*

Epſom water is eaſily imitated by art; *i. e.* by only diſſolving half an ounce of Epſom ſalt in a quart of pure water, made ſomewhat briſk or quick by a few drops of ſpirit of vitriol and oil of tartar, ſo as to let the alkali prevail.

EPULARES, in antiquity, an epithet given to thoſe who were admitted to the ſacred *epulæ* or entertainments, it being unlawful for any to be preſent at them who were not pure and chaſte.

EPULO, in antiquity, the name of a miniſter of ſacrifice among the Romans.

The pontifices, not being able to attend all the ſacrifices performed at Rome to ſo many gods as were adored by that people, appointed three miniſters, whom they called *epulones*, becauſe they conferred on them the care and management of the *epula*, feaſts in the ſolemn games and feſtivals. To them belonged the ordering and ſerving the ſacred banquet, offered on ſuch occaſions to Jupiter, &c. They wore a gown bordered with purple like the pontifices. Their number was at length augmented from three to ſeven, and afterwards by Cæſar to ten. Their firſt eſtabliſhment was in the year of Rome 558, under the conſulate of L. Furius Purpureo, and M. Claudius Marcellus.

EPULUM, in antiquity, a holy feaſt prepared for the gods in times of public danger. The feaſt was ſumptuous, and the gods were formally invited and attended; for the ſtatues were brought on rich beds furniſhed with ſoft pillows, called *pulvinaria*: Thus accommodated, their godſhips were placed on their couches at the moſt honourable part of the table. The care of the *epula* belonged to the *epulones*, and the gods were plentifully ſerved with the richeſt dainties, as if they were able to eat; but the *epulones* performed that function for them, and doubtleſs were competent proxies! No wonder that Pliny ſolicited Trajan to be admitted of their order.

EPULUM is alſo uſed to ſignify any ſolemn feaſt; ſo we meet with *epulum ferale*, "a funeral entertainment."

EQUABLE, an appellation given to ſuch motions as always continue the ſame in degree of velocity, without being either accelerated or retarded.

EQUAL, a term of relation between two or more things of the ſame magnitude, quantity, or quality.

Mathematicians ſpeak of *equal* lines, angles, figures, circles, ratios, ſolids.

EQUALITY, that agreement between two or more things, whereby they are denominated equal.

EQUANIMITY, in ethics, denotes that even and calm frame of mind and temper, under good or bad fortune, whereby a man appears to be neither puffed up nor overjoyed with proſperity, nor diſpirited, ſoured, or rendered uneaſy by adverſity.

EQUATIONS, in algebra. See ALGEBRA, chap. iii.

*EQUATION of Time*, in aſtronomy and chronology, the reduction of the apparent time or motion of the ſun, to equable, mean, or true time. See ASTRONOMY, n° 383.

EQUATOR, or ÆQUATOR, in aſtronomy and geography, a great circle of the ſphere, equally diſtant from the two poles of the world, or having the ſame poles with thoſe of the world. It is called the *equator*, becauſe when the ſun is in it the days and nights are *equal*; whence alſo it is called the *equinoctial*; and when drawn on maps and planiſpheres, the *equinoctial line*, or ſimply the *line*. Every point of the equator is a quadrant's diſtance from the poles of the world; whence it follows, that the equator divides the ſphere into two hemiſpheres, in one of which is the northern, and in the other the ſouthern pole.

EQUATORIAL INSTRUMENT. See ASTRONOMY, n° 499, 504.

EQUERY, or ECURY, a grand ſtable or lodge for horſes, furniſhed with all the conveniences thereof; as ſtalls, manger, rack, &c. The word is formed from the French *eſcurie*, which ſignifies the ſame thing. Some again derive *eſcurie* from the Latin *ſcuria*, which not only denotes a place for beaſts to be put up in, but alſo a grange or barn. But a more probable derivation is from *equile* "a ſtable for horſes," of *equus* "horſe." Some hold that the word *ſtable*, in propriety, relates only to bullocks, cows, ſheep, hogs, &c. and *equery*, to horſes, mules, &c.

A *ſimple equery* is that provided for one row of horſes; a *double equery* that provided for two, with a paſſage in the middle, or two paſſages: the horſes being placed head to head, as in the little equery at Verſailles.

Under equery are ſometimes alſo comprehended the lodgings and apartments of the equerries, grooms, pages, &c.

EQUERY (*eſcuyer*), is alſo an officer who has the care and management of the horſes of a king or prince.

EQUERIES, or EQUERRIES, popularly called *Querries*, are particularly uſed among us for officers of the king's ſtables, under the maſter of the horſe, ſeven in number, who, when his majeſty goes abroad, ride in the leading coach, are in waiting one at a time monthly, and have a table with the gentlemen-uſhers during the time, and a ſalary of L. 300 a-year each. They uſed to ride on horſeback by the coach-ſide when the king travelled; but that being more expenſive to them than neceſſary to the ſovereign, it has been diſcontinued.

*EQUERIES of the Crown Stable* have that appellation, as being employed in managing and breaking the ſaddle-horſes, and preparing them for the king's riding. Theſe are two in number; the firſt having an annual ſalary of L. 256, and the ſecond L. 200, whereof one is, or always ſhould be, in cloſe waiting at court; and when his majeſty rides, holds the ſtirrup, while the maſter of the horſe, or one of the equeries in his abſence, aſſiſts in mounting him; and when his majeſty rides, they uſually attend him.

EQUES, in antiquity. See EQUESTRIAN *Order*, and EQUITES.

*EQUES Auratus*, is uſed to ſignify a knight-bachelor, called *auratus*, q. d. *gilt*, becauſe anciently none but knights might gild or beautify their armour or other habiliments of war with gold. In law this term is not uſed, but inſtead of it *miles*, and ſometimes *chevalier*.

EQUESTRIA, among the Romans, a place in the theatre where the equites or knights ſat.

EQESTRIAN (*Equeſtris*), a term chiefly uſed in the phraſe *equeſtrian ſtatue*, which ſignifies a ſtatue repreſenting a perſon mounted on horſeback. The word is formed of the Latin *eques*, "knight, horſeman," of *equus*, "horſe."

*EQUESTRIAN Games*, among the Romans, horſe-races, of which there were five kinds, the *prodromus* or *plain horſe-race*, the *chariot-race*, the *decurſory-race* about funeral piles, the *ludi ſevirales*, and the *ludi neptunales*.

*EQUESTRIAN Order*, among the Romans, ſignified their knights or equites; as alſo their troopers or horſemen in the field; the firſt of which orders ſtood in contradiſtinction to the ſenators; as the laſt did to the foot, military, or infantry. Each of theſe diſtinctions was introduced into the ſtate by Romulus.

EQUIANGULAR, in geometry, an epithet given to figures whoſe angles are all equal: ſuch are a ſquare, an equilateral triangle, &c.

EQUIDISTANT, an appellation given to things placed at equal diſtances from ſome fixed point or place to which they are referred.

EQUILATERAL, in general, ſomething that hath equal ſides; as an equilateral triangle.

EQUILIBRIUM, in mechanics, is when the two ends of a lever or balance hang ſo exactly even and level, that neither doth aſcend or deſcend, but both keep in a poſition parallel to the horizon; which is occaſioned by their being both charged with an equal weight.

EQUIMULTIPLES, in arithmetic and geometry, are numbers or quantities multiplied by one and the ſame number or quantity. Hence, equimultiples are always in the ſame ratio to each other as the ſimple quantities before multiplication: thus, if 6 and 8 are multiplied by 4, the equimultiples 24 and 32 will be to each other as 6 to 8.

EQUINOCTIAL, or ÆQUINOCTIAL, in aſtronomy, a great and immoveable circle of the ſphere, under which the equator moves in its diurnal motion.

The equinoctial or equinoctial line, is ordinarily confounded with the equator: but there is a difference; the equator being moveable, and the equinoctial immoveable; and the equator being drawn about the convex ſurface of the ſphere, but the equinoctial on the concave ſurface of the magnus orbis.

Whenever the ſun in his progreſs through the ecliptic comes to this circle, it makes equal days and nights all around the globe; as then riſing due eaſt and ſetting due weſt, which he never does at any other time of the year. And hence the denomination from *æquus* and *nox*, "night," *quia æquat diem nocti.*

The equinoctial then is the circle which the ſun deſcribes, or appears to deſcribe, at the time of the equinoxes; that is, when the length of the day is every where equal to that of night, which happens twice a-year. See EQUINOX.

EQUINOCTIAL, in geography. See EQUATOR.

The ſhadows of thoſe who live under this circle are caſt to the ſouthward of them for one half of the year, and to the northward of them during the other half; and twice in a year, *viz.* at the equinoxes, the ſun at noon caſts no ſhadow, being in their zenith.

From this circle is the declination or latitude of places accounted in the degrees of the meridian.

*EQUINOCTIAL Points*, are the two points wherein the equator and ecliptic interſect each other: the one being in the firſt point of Aries, is called the *vernal point* or *equinox;* and the other in the firſt point of Libra, the *autumnal point* or *equinox.*

*EQUINOCTIAL Dial,* is that whoſe plane lies parallel to the equinoctial. See DIAL.

EQUINOX, or ÆQUINOX, in aſtronomy, the time when the ſun enters one of the equinoctial points.

The equinoxes happen when the ſun is in the equinoctial circle; when of conſequence the days are equal to the nights throughout the world, which is the caſe twice a year, *viz.* about the 20th of March and the 23d of September, the firſt of which is the vernal and the ſecond the autumnal equinox.

It is found by obſervation, that the equinoctial points, and all the other points of the ecliptic, are continually moving backward, or *in antecedentia*, that is, weſtward. This retrograde motion of the equinoctial points, is that famous and difficult phenomenon called the *preceſſion of the equinoxes.* See ASTRONOMY, n° 348, 349.

EQUIPAGE, in the military art, denotes all ſorts of utenſils, artillery, &c. neceſſary for commencing and proſecuting with eaſe and ſucceſs any military operations. Camp and field equipage conſiſts of tents, kitchen-furniture, ſaddle-horſes, baggage, waggons, bat-horſes, &c.

To EQUIP, in naval language, a term borrowed from the French marine, and frequently applied to the buſineſs of fitting a ſhip for ſea, or arming her for war.

EQUIPOLLENCE, in logic, is when there is an equivalence between any two or more terms or propoſitions; *i. e.* when they ſignify one and the ſame thing, though they expreſs it differently. Such propoſitions, &c. are ſaid to be *equipollent.*

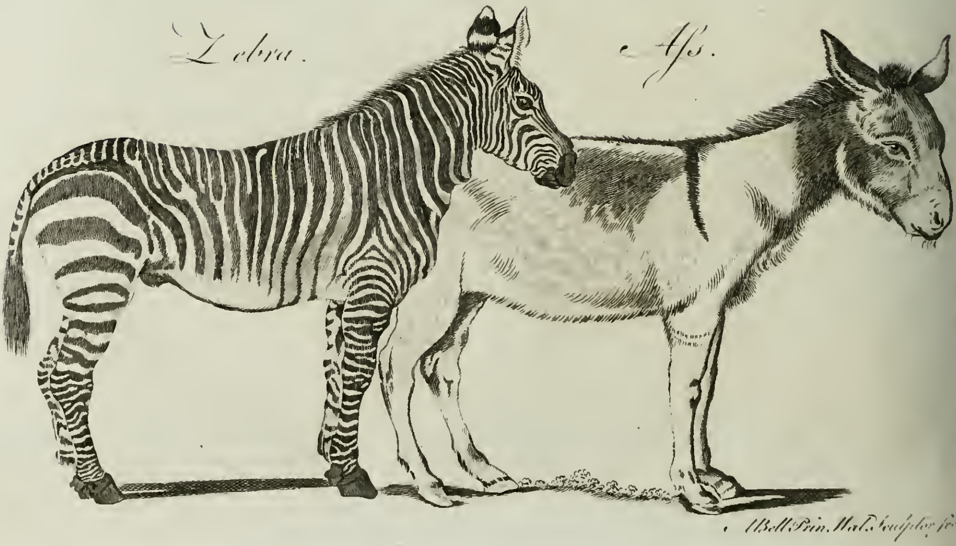
EQUIRIA, in antiquity, a feſtival inſtituted by Romulus, and celebrated on the 27th of February, in honour of Mars, at which there were horſe-races.

EQUISETUM, HORSE-TAIL: A genus of the order of filices, belonging to the cryptogamia claſs of plants; and in the natural method ranking under the 51ſt order, *Coniferæ.* There is a ſpike of peltated or ſhielded fructifications opening at the baſe. There are ſeven ſpecies; of which the moſt remarkable are, 1. The ſylvaticum, or wood horſe-tail. It grows in woods and moiſt ſhady places in many parts of England and Scotland. The ſtalk riſes from 12 to 18 inches high, angular, and rough to the touch; the angles being edged with ſharp *ſpiculæ*, ſcarce viſible without a microſcope. The leaves grow verticillate, 12 or more in a whorl, and theſe whorls are about an inch diſtant from one another. The leaves are very ſlender, nearly quadrangular, about five inches long, pendent, and beſet with ſeveral other ſecondary whorls, ſo that it reſembles a pine-tree in miniature. Horſes are very fond of this plant, and in ſome parts of Sweden it is collected to ſerve them as winter food. 2. The arvenſe, common or corn horſe-tail, grows in wet meadows and corn-fields. The moſt remarkable property of this is, that its ſeeds, when viewed by a microſcope, are ſeen to leap about as if they were animated. It has a very aſtringent and diuretic quality, and has been eſteemed ſerviceable in the *hæmaturia* and *gonorrhœa*, but is diſregarded by the preſent practice. It is a troubleſome plant in paſtures; and diſagreeable to cows, being never touched by them unleſs they are compelled by hunger, and then it brings on an incurable diarrhœa. It does not ſeem to affect horſes or ſheep. 3. The paluſtre, marſh horſe-tail, or paddock pipe, is frequent in marſhes and ditches. It is not ſo rough as the former, but is likewiſe prejudicial to cattle. 4. The fluviatile, or great river horſe-tail, is frequent in ſhady marſhes, and on the brinks of ſtagnant waters. It is the largeſt of all the ſpecies, growing ſometimes to the height of a yard, and near an inch in diameter. Haller tells us, that this kind of equiſetum was eaten by the Romans; and Linnæus affirms, that oxen and rein-deer are fond of it, but that horſes refuſe it. 5. The hyemale, rough horſe-tail, ſhave-graſs, or Dutch ruſhes. This is much uſed by the whiteſmiths and cabinet-makers, under the name of *Dutch ruſhes*, for poliſhing their metals and wood. All the other ſpecies will anſwer this purpoſe in ſome degree, but the laſt better than any of the reſt. In Northumberland the dairy-maids ſcour and clean their milk-pails with it. Some imagine, that if cows are fed with this ſpecies, their teeth will fall out.

EQUITES, amongſt the Romans, were perſons of the ſecond degree of nobility, immediately ſucceeding the ſenators in point of rank. The *equites* or knights were required to be poſſeſſed of 400 *ſeſtertia* before they could be admitted into that order; and when the knights were ſo reduced as to fall ſhort of the preſcribed

*Horse.*

*Zebra.* *Ass.*



*I. Bell Prin. Mal. Sculptor fecit*

ſcribed revenue, they were expunged out of the equeſtrian liſt. The equeſtrian revenue juſt mentioned amounted to about 10,000 crowns.

Part of the ceremony whereby the honour of knighthood was conferred amongſt the Romans was the giving of a horſe; for every *eques* or knight had a horſe kept at the public charge, he received alſo the ſtipend of an horſeman to ſerve in the wars, and wore a ring which was given him by the ſtate. The *equites* compoſed a large body of men, and conſtituted the Roman cavalry; for there was always a ſufficient number of them in the city, and nothing but a review was requiſite to fit them for ſervice.

The knights at laſt grew too powerful, were a balance for the ſenate and people, neglected the exerciſes of war, and betook themſelves to civil employments. The *equites* were liable to be puniſhed by the cenſors, and to ſuffer degradation. They were degraded by taking from them the horſe which was kept for each of them at the public charge; this was called *equum adimere*.

EQUITY, in a general ſenſe, the virtue of treating all other men according to reaſon and juſtice, or as we would gladly be treated ourſelves when we underſtand aright what is our due. See JUSTICE.

EQUITY, in juriſprudence, is defined a correction or qualification of the law, generally made in that part wherein it faileth or is too ſevere. It likewiſe ſignifies the extenſion of the words of the law to caſes unexpreſſed, yet having the ſame reaſon; ſo that where one thing is enacted by ſtatute, all other things are enacted that are of the like degree. For example, the ſtatute of *Glouc.* gives action of waſte againſt him that holds lands for life or years; and by the equity thereof, a man ſhall have action of waſte againſt a tenant that holds but for one year, or one half-year, which is without the words of the act, but within the meaning of it; and the words that enact the one, by *equity* enact the other. So that equity is of two kinds. The one abridges and takes from the letter of the law: the other enlarges and adds to it; and ſtatutes may be conſtrued according to equity, eſpecially where they give remedy for wrong, or are for expedition of juſtice. Equity ſeems to be the interpoſing *law of reaſon*, exerciſed by the lord chancellor in extraordinary matters to do equal juſtice; and by ſupplying the defects of the law, gives remedy in all caſes. See CHANCERY.

EQUITY, in mythology, ſometimes confounded with *Juſtice*, a goddeſs among the Greeks and Romans, repreſented with a ſword in one hand and a balance in the other.

EQUIVALENT, is underſtood of ſomething that is equal in value, force, or effect, to another.

Equivalence is of various kinds, in propoſitions, in terms, and in things.

*EQUIVALENT Propoſitions.* See EQUIPOLLENCE.

*EQUIVALENT Terms* are where ſeveral words that differ in ſound have yet one and the ſame ſignification; as *every body was there*, and *nobody was abſent*, *nihil non*, and *omne*.

*EQUIVALENT Things*, are either *moral*, *phyſical*, or *ſtatical*. *Moral*, as when we ſay that the commanding or adviſing a murder is a guilt equivalent to that of the murderer. *Phyſical*, as when a man who has the ſtrength of two men is ſaid to be equivalent to two men. *Statical*, whereby a leſs weight becomes of equal force with a greater, by having its diſtance from the centre increaſed.

EQUIVOCAL TERMS or WORDS, among logicians, are thoſe which have a doubtful or double meaning.

According to Mr Locke, the doubtfulneſs and uncertainty of words has its cauſe more in the ideas themſelves, than in any incapacity of the words to ſignify them; and might be avoided, would people always uſe the ſame term to denote the ſame idea or collection of ideas: but, adds he, it is hard to find a diſcourſe on any ſubject where this is the caſe; a practice which can only be imputed to folly or great diſhoneſty; ſince a man, in making up his accounts, might with as much fairneſs uſe the numeral characters ſometimes for one ſometimes for another collection of units.

*EQUIVOCAL Generation*, the production of animals without the intercourſe between the ſexes, by the influence of the ſun or ſtars, &c.

This kind of generation is now quite exploded by the learned.

EQUIVOCATION, the uſing a term or expreſſion that has a double ſignification. Equivocations are expedients to ſave telling the truth, and yet without telling a falſity. The fathers are great patrons of equivocations and mental reſervations, holding that the uſe of ſuch ſhifts and ambiguities is in many caſes allowable.

EQUULEUS, or ECCULEUS, in antiquity, a kind of rack uſed for extorting a confeſſion, at firſt chiefly practiſed on ſlaves, but afterwards made uſe of againſt the Chriſtians.

The equuleus was made of wood, having holes at certain diſtances, with a ſcrew, by which the criminal was ſtretched to the third, ſometimes to the fourth, or fifth holes, his arms and legs being faſtened on the equuleus with cords; and thus was hoiſted aloft, and extended in ſuch a manner, that all his bones were diſlocated. In this ſtate red-hot plates were applied to his body, and he was goaded in the ſides with an inſtrument called *ungula*.

EQUULEUS, EQUICULUS, and *Equus Minor*, the horſe's head, in aſtronomy, a conſtellation of the northern hemiſphere, whoſe ſtars in Ptolemy's catalogue are 4, in Tycho's 4, in Hevelius's 6, and in Mr Flamſteed's 10.

Plate CLXXXIII.

EQUUS, in zoology, a genus of quadrupeds belonging to the order of belluæ. This genus comprehends the horſe, the mule, the aſs, the zebra, and the quagga: they have ſix erect and parallel fore-teeth in the upper jaw, and ſix ſomewhat prominent ones in the under jaw; the dog-teeth are ſolitary, and at a conſiderable diſtance from the reſt; and the feet conſiſt of an undivided hoof.

1. The *caballus*, or HORSE, has a long flowing mane, and the tail covered on all parts with long hairs.

*Buffon Hiſtoire Naturelle.*

The horſe, in a domeſtic ſtate, is a bold and fiery animal; equally intrepid as his maſter, he faces danger and death with ardour and magnanimity. He delights in the noiſe and tumult of arms, and ſeems to feel the glory of victory: he exults in the chaſe; his eyes ſparkle with emulation in the courſe. But though bold and intrepid, he is docile and tractable: he knows how to govern and check the natural vivacity and fire of his temper. He not only yields to the hand, but ſeems to conſult the inclination of his rider. Conſtantly obedient to the impreſſions he receives, his motions are entirely regulated by the will of his maſter. He in ſome meaſure reſigns his very exiſtence to the pleaſure of man. He delivers up his whole powers; he reſerves nothing; he will rather die than diſobey. Who could endure to ſee a character ſo noble abuſed! who could be guilty of ſuch groſs barbarity!

This character, though natural to the animal, is in ſome meaſure the effect of education. His education commences with the loſs of liberty, and is finiſhed by conſtraint. The ſlavery of the horſe is ſo ancient and ſo univerſal, that he is but rarely ſeen in a natural ſtate. Several ancient writers talk of wild horſes, and even mention the places where they were to be found. Herodotus takes notice of white ſavage horſes in Scythia; Ariſtotle ſays they are to be found in Syria; Pliny, in the northern regions; and Strabo, in Spain and the Alps. Among the moderns, Cardan ſays, that wild horſes are to be found in the Highlands of Scotland and the Orkney iſles; Olaus, in Muſcovy; Dapper, in the iſland of Cyprus; Leo and Marmol, in Arabia and Africa, &c. But as Europe is almoſt equally inhabited, wild horſes are not to be met with in any part of it: and thoſe of America were originally tranſported from Europe by the Spaniards; for this ſpecies of animals did not exiſt in the new world. The Spaniards carried over a great number of horſes, left them in different iſlands, &c. with a view to propagate that uſeful animal in their colonies. Theſe have multiplied incredibly in the vaſt deſarts of thoſe thinly peopled countries, where they roam at large without any reſtraint. M. de Salle relates, that he ſaw, in the year 1685, horſes feeding in the meadows of North America, near the bay of St Louis, which were ſo ferocious that nobody durſt come near them. Oexmelin ſays, that he has ſeen large troops of them in St Domingo running in the valleys: that when any perſon approached, they all ſtopped; and one of them would advance till within a certain diſtance, then ſnort with his noſe, take to his heels, and the whole troop after him. Every author who takes notice of theſe horſes of America, agree that they are ſmaller and leſs handſome than thoſe of Europe. Theſe relations ſufficiently prove, that the horſe, when at full liberty, though not a fierce or dangerous animal, has no inclination to aſſociate with mankind; that all the ſoftneſs and ductility of his temper proceeds entirely from the culture and poliſh he receives in his domeſtic education, which in ſome meaſure commences as ſoon as he is brought forth.

The motions of the horſe are chiefly regulated by the bit and the ſpur; the bit informs him how to direct his courſe, and the ſpur quickens his pace. The mouth of the horſe is endowed with an amazing ſenſibility: the ſlighteſt motion or preſſure of the bit gives him warning, and inſtantly determines his courſe.

The horſe has not only a grandeur in his general appearance, but there is the greateſt ſymmetry and proportion in the different parts of his body. The regularity and proportion of the different parts of the head gives him an air of lightneſs, which is well ſupported by the ſtrength and beauty of his cheſt. He erects his head, as if willing to exalt himſelf above the condition of other quadrupeds: his eyes are open and lively; his ears are handſome, and of a proper height; his mane adorns his neck, and gives him the appearance of ſtrength and boldneſs.

At the age of two years, or two years and a half, the horſe is in a condition to propagate; and the mare, like moſt other females, is ready to receive him ſtill ſooner. But the foals produced by ſuch early embraces are generally ill-made and weakly. The horſe ſhould never be admitted to the mare till he is four or four and a half; this is only meant with regard to draught-horſes. Fine horſes ſhould not be admitted to the mare before they be ſix years old; and Spaniſh ſtallions not till ſeven. The mares are generally in ſeaſon from the beginning of April to the end of June; but their chief ardour for the horſe laſts but about 15 or 20 days, and this critical ſeaſon ſhould always be embraced. The ſtallion ought to be ſound, well made, vigorous, and of a good breed. For fine ſaddle-horſes, foreign ſtallions, as Arabians, Turks, Barbs, and Andaluſians, are preferable to all others. Next to theſe, Britiſh ſtallions are the beſt; becauſe they originally ſprang from thoſe above-mentioned, and are very little degenerated. The ſtallions of Italy, and eſpecially the Neapolitans, are very good. The beſt ſtallions for draught or carriage horſes, are thoſe of Naples, Denmark, Holſtein, and Freezeland. The ſtallions for ſaddle-horſes ſhould be from 14 to 15 hands high, and for draught horſes at leaſt 15 hands. Neither ought the colour of ſtallions to be overlooked; as a fine black, grey, bay, ſorrel, &c. Beſides theſe external qualities, a ſtallion ought to have courage, tractability, ſpirit, agility, a ſenſible mouth, ſure limbs, &c. Theſe precautions in the choice of a ſtallion are the more neceſſary, becauſe he has been found by experience to communicate to his offspring almoſt all his good or bad qualities, whether natural or acquired.

The mare contributes leſs to the beauty of her offſpring than the ſtallion; but ſhe contributes perhaps more to their conſtitution and ſtature: for theſe reaſons, it is neceſſary that the mares for breed be perfectly ſound, and make good nurſes. For elegant horſes, the Spaniſh and Italian mares are beſt; but for draught-horſes, thoſe of Britain and Normandy are preferable. However, when the ſtallions are good, the mares of any country will produce fine horſes, provided they be well made and of a good breed.

Mares go with young 11 months and ſome days. They bring forth ſtanding; contrary to the courſe of moſt other quadrupeds, who lie during this operation. They continue to bring forth till the age of 16 or 18 years; and both horſes and mares live between 25 and 30 years. Horſes caſt their hair once a-year, generally in the ſpring, but ſometimes in the autumn. At this time they are weak, and require to be better fed and taken care of than at any other ſeaſon.

In Perſia, Arabia, and moſt eaſtern countries, they never geld their horſes, as is done in Europe and China. This operation greatly diminiſhes their ſtrength, courage, and ſpirit; but it makes them good humoured, gentle, and tractable. With regard to the time of performing this operation, the practice of different countries is different: ſome geld their horſes when a year old, and others at 18 months. But the beſt and moſt general practice is to delay the operation till they be two years old at leaſt: becauſe, when the gelding is delayed for two years or more, the animals retain more of the ſtrength and other qualities which naturally belong to the male.

As the utility of horſes ſurpaſſes that of all other domeſtic animals, it may be of uſe to ſubjoin ſome marks by which the age and other properties of horſes may be diſtinguiſhed.

In old horſes, the eye-pits are generally deep; but this is only an equivocal mark, being alſo found in young horſes begot by old ſtallions. The moſt certain knowledge of the age is to be obtained from the teeth. Of theſe a horſe has 40; 24 grinders or double-teeth, four tuſhes, and 12 fore-teeth: mares have no tuſhes, or at leaſt very ſhort ones. It is not from the grinders that we know the age; it is diſcovered firſt by the fore-teeth, and afterwards by the tuſhes. The 12 fore-teeth begin to ſhoot within 12 days after the colt is foaled. Theſe firſt, or foal-teeth, are round, ſhort, not very ſolid, and are caſt at different times, to be replaced by others. At the age of two years and a half, the four middle fore-teeth are caſt, two in the upper jaw, and two in the lower. In one year more, four others drop out, one on each ſide of the former, which are already replaced. When he is about four years and a half old, he ſheds four others, and always next to thoſe which have fallen out and been replaced. Theſe four foal-teeth are replaced by four others, but are far from growing ſo faſt as thoſe which replaced the eight former, and are called the *corner teeth*; they replace the four laſt foal-teeth, and by theſe the age of a horſe is diſcovered. They are eaſily known, being the third both above and below, counting from the middle of the jaw. They are hollow, and have a black mark in their cavity. When the horſe is four years and a half old, they are ſcarce viſible above the gum, and the cavity is very ſenſible: at ſix and a half, they begin to fill; and the mark continually diminiſhes and contracts till ſeven or eight years, when the cavity is quite filled up, and the black ſpot effaced. After eight years, theſe teeth ceaſing to afford any knowledge of the age, it is judged of by the tuſhes: which are four teeth adjoining to thoſe laſt mentioned; and, like the grinders, are not preceded by any other teeth. The two in the lower jaw uſually begin to ſhoot at three years and a half, and thoſe of the upper jaw at four; continuing very ſharp-pointed till ſix. At 10, the upper ſeem blunted, worn out, and long, the gum contracting itſelf as its years increaſe; the barer therefore they are, the older is the horſe. From 10 to 13 or 14 years, little can be ſeen to indicate the age; but at that time ſome hairs of the eye-brows begin to turn grey. This mark, however, is equivocal, like that drawn from the depth of the eye-pits; horſes from old ſtallions or mares, having grey hairs in the eye-brows when they are not above nine or ten years old. In ſome horſes the teeth are of ſuch a hardneſs as not to wear; and in ſuch the black mark always ſubſiſts, being never effaced by time: but the age of theſe horſes, which are called *beguts* by the French, is eaſily known; the hollow of the tooth being filled up, and at the ſame time the tuſhes very long. It has been farther obſerved, that this is more common in mares than in horſes. The age of a horſe may be alſo known, though leſs accurately, by the bars in his mouth, which wear away as he advances in years.

When the horſe is without blemiſh, the legs and thighs are clean, the knees ſtraight, the ſkin and ſhank thin, and the back-ſinew ſtrong and well-braced. The ſinews and the bones ſhould be ſo diſtinct, as to make the legs appear thin and lathy, not full and round. The paſtern joints ſhould never be large and round; nor muſt there be any ſwelling near the coronet. The hock ſhould be lean and dry, not puffed up with wind. With regard to the hoof, the coronet ſhould be equally thick, and the horn ſhining and greyiſh. A white horn is a ſign of a bad foot, for it will wear out in a ſhort time; and likewiſe when the horn is thin, it is liable to be ſpoiled in ſhoeing, and by travelling hard on ſtony grounds. This is beſt known when the ſhoe is taken off; for then the verge all round the foot will appear thin, and the horſe will wince at the leaſt touch of the pincers.

A ſtrong foot has the fibres of the hoof very diſtinct running in a direct line from the coronet to the toe, like the grain of wood. In this caſe, care muſt be taken to keep the foot moiſt and pliable. The greateſt inconvenience attending a hard ſtrong foot, is its being ſubject to rifts and fiſſures, which cleave the hoof quite through ſometimes from the coronet down to the bottom.

A narrow heel is likewiſe a defect; and when it is not above two fingers in breadth, the foot is bad. A high heel cauſes a horſe to trip and ſtumble often; and the low one, with long yielding paſterns, is very apt to be worn quite away on a journey. Too large a foot in proportion to the reſt of the body, renders a horſe weak and heavy.

The head of a horſe ſhould be ſmall, and rather lean than fleſhy. The ears ſhould be ſmall, erect, thin, ſprightly, and pointed. The forehead, or brow, ſhould be neither too broad nor too flat, and ſhould have a ſtar or ſnip thereon. The noſe ſhould riſe a little, and the noſtrils ſhould be wide that he may breathe more freely. The muzzle ſhould be ſmall, and the mouth neither too deep nor too ſhallow. The jaws ſhould be thin, and not approach too near together at the throat, nor too high upwards towards the onſet, that the horſe may have ſufficient room to carry his head in an eaſy graceful poſture. The eyes ſhould be of a middle ſize, bright, lively, and full of fire. The tongue ſhould be ſmall, that it may not be too much preſſed by the bit; and it is a good ſign when his mouth is full of white froth, for it ſhows that he will not ſoon be overheated.

The neck ſhould be arched towards the middle, growing ſmaller by degrees from the breaſt and ſhoulders to the head. The hair of the main ſhould be long, ſmall, and fine; and if it be a little frizzled, ſo much the better. The ſhoulders ſhould be pretty long; the withers thin, and enlarge gradually from thence downwards; but ſo as to render his breaſt neither too narrow nor too groſs. A thick-ſhouldered horſe ſoon tires, and trips and ſtumbles every minute; eſpecially if he has a thick large neck at the ſame time. When the breaſt is ſo narrow that the fore-thighs almoſt touch, they are never good for much. A horſe of a middle ſize ſhould have the diſtance of five or ſix inches between his fore-thighs, and there ſhould be leſs diſtance between his feet than his thighs near the ſhoulders when he ſtands upright.

The body or carcaſe of a horſe ſhould be of a middling ſize in proportion to his bulk, and the back ſhould ſink a little below the withers; but the other parts ſhould be ſtraight, and no higher behind than before. He ſhould alſo be home-ribbed; but the ſhort ribs ſhould not approach too near the haunches, and then he will have room to fetch his breath. When a horſe's back is ſhort in proportion to his bulk, and yet otherwiſe well limbed, he will hold out a journey, tho' he will travel ſlow. When he is tall, at the ſame time with very long legs, he is but of little value.

The wind ſhould never be overlooked in the choice of a horſe: and it may eaſily be known by his flanks, if he is broken-winded, when he ſtands quiet in the ſtable; becauſe he always pinches them in with a very ſlow motion, and drops them ſuddenly. A thick-winded horſe fetches his breath often, and ſometimes rattles and wheezes. This may be always diſcovered when he is put to briſk exerciſes.

The temper of a horſe ſhould always be obſerved; a vicious horſe generally lays his ears cloſe to his pole, ſhows the whites of his eyes, and looks ſullen and dogged. An angry horſe may be known by his frowning looks; and he generally ſeems to ſtand in a poſture of defence. When he is very vicious, he pays no regard to the groom that feeds him: However, ſome horſes that are ticklиſh will lay back their ears, and yet be of a good diſpoſition. A fearful horſe is apt to ſtart, and never leaves it off till he is old and uſeleſs. A fretful horſe is very unfit for a journey; and you may diſcover his temper as ſoon as he gets out of the ſtable. A dull, heavy, ſluggiſh horſe may be eaſily known, whatever tricks are uſed to rouſe his ſpirits.

With regard to the colour of a horſe, the bright bay, and indeed all kinds of bays in general, are accounted good colours. The cheſnut horſe is generally preferable to the ſorrel, unleſs the former happens to be bald, or party-coloured, with white legs. Brown horſes have generally black manes and tails, and their joints are of a ruſty black. Thoſe of this colour that are dappled, are much handſomer than the reſt. Horſes of a ſhining black, and well marked without too much white, are in high eſteem for their beauty. A ſtar, or blaze, or white muzzle, or one or more feet tipped with white, are thought to be rather better than thoſe that are quite black.

Of greys, the dappled are accounted beſt; though the ſilver grey make a more beautiful appearance, and often prove good. The iron grey with white manes and tails are thought not to be ſo hardy. Greys of every kind will turn white ſooner or later; but the nutmeg grey, when the dappled parts incline to bay or cheſnut, are ſaid to be good hardy horſes. Roan horſes have a diverſity of colours mixed together; but the white is more predominant than the reſt. They are all generally hardy, and fit for the road; and ſome are exceeding good. Thoſe of a ſtrawberry colour moſt reſemble the ſorrel, and they are often marked with white on the face and legs. When the bay is blended with it, he ſeems to be tinctured with claret; and ſome of theſe prove to be very good. Dun, ſallow, and cream-coloured horſes have a liſt down their backs; and their manes and tails are black. Dun horſes are ſeldom choſen by gentlemen, and yet they may be very uſeful to the country farmer. The ſallow and cream-coloured are more eſteemed, both for beauty and uſe. Thoſe horſes that are finely ſpotted with gay colours like leopards are a great rarity, and for that reaſon are only in the hands of great men.

There is ſome difference in horſes according to the different countries where they are bred. For inſtance, in France, thoſe of Bretagne are pretty ſtrong made, and have generally black hair, or brown bay; and they have good legs and feet, with a hardy mouth, and a head ſhort and fleſhy; but in general they are pretty clumſy. The horſes of Franche Compté are ſaid to have the legs of tigers, and the belly of a hind; but they are ſhort and thick, and of a middle ſize; being much more proper for drawing than riding. The horſes of Gaſcony are not unlike thoſe of Spain; but they are not ſo handſome nor ſo active, and therefore they are more proper to draw carriages. The Limoſin horſes are very vicious, and are good for little till they are ſix years old. Their colour is generally bay, or a bay brown. The horſes of Normandy are much like thoſe of Bretagne; and thoſe of Poitou have good bodies, legs, feet, and eyes; but they are far from being handſome.

The horſes of Germany are much better and more handſome than thoſe of the Low Countries. They are of great uſe for carriages; but much more for the army, and for drawing the artillery. They have a great deal of hair, eſpecially about the legs. They are not large, but they are well ſet; and yet they have tender feet. The Hungarian horſes are excellent for the coach, as well as for riding: but they are large, though well proportioned; and they are of all colours, and in general very ſwift.

The Daniſh horſes are low, ſhort, and ſquare; but they have a fine head, and ſhort hair. The horſes of the Low Countries are very fit for the coach, and they are beſt known by the name of *Flanders-mares*. The Poliſh horſes are like the Daniſh; only they have not ſo fine a fore-hand: their colour is generally a bright bay, and that of the outward peel of an onion; and they are fiery and vicious. The horſes of Switzerland are pretty much like thoſe of Germany; which is no wonder, ſince the Germans purchaſe a great number of them. The horſes of Piedmont are fiery, of a middle ſize, and of all ſorts of colours; their legs are good and handſome, their eyes fine, their ears ſmall, and their mouths good; but they do not carry their heads well.

The horſes of Naples and Italy are generally ill-made and lean; and yet they are good and uſeful, for they are light and proper for racing, though not for a long courſe; they never do well in a colder climate. The Spaniſh horſes are very well made and handſome, as well as very active and nimble; they have good eyes, handſome legs and heads, and are eaſily managed; they are alſo good for racing, if they are well kept: however, they are not ſo good in northern climates as in their own country. The Turkiſh horſes are of different ſhapes; but they are generally ſwift, tho' their mouths are bad. Moſt of them are white; tho' there are other colours; and they are large, hardy, ſtrong, and fit for the road.

The horſes of Barbary, commonly called *barbs*, have ſtrong hoofs, and are more proper for racing than any others whatever: ſome have ſaid they never grow old, becauſe they preſerve their vigour to the laſt. They are excellent ſtallions; and ſome of them are uſed as ſuch in Britain: however, the Arabian horſes are not quite ſo good as the Barbary, though ſome think they are both of the ſame kind; only thoſe that are uſed to the deſerts of Arabia are always in action. The horſes of the Gold Coaſt of Guinea are very few in number, and in other parts of that coaſt there are none at all; for many of the negroes, when they have been firſt brought over to our American plantations, have expreſſed great admiration at the ſight of a horſe, and even been afraid to come near one.

The horſes of the Cape of Good Hope were originally brought from Perſia: and they are generally ſmall, and of a cheſnut colour; for thoſe that are natives of that country are all wild, and could never yet be tamed. The horſes of China are good, and more particularly thoſe in the province of Yun Nan; for they are very vigorous, though a little low. The horſes of the Eluth Tartars are good and full of fire; and their ſize is much the ſame as the Poliſh horſes: they are afraid of nothing; not even of lions and tigers: but perhaps this may be owing to uſe. In the country of the Mogul they are very numerous, and of all colours: they are generally of the middle ſize, though there are ſome as large and as handſome as thoſe in Europe. The wild horſes of Tartary differ very little from the tame; but they are ſo ſwift, that they avoid the arrows of the moſt ſkilful hunters.

The breed of horſes in Great Britain is as mixed as that of its inhabitants: the frequent introduction of foreign horſes has given us a variety that no ſingle country can boaſt of: moſt other countries produce only one kind; while ours, by a judicious mixture of the ſeveral ſpecies, by the happy difference of our ſoils, and by our ſuperior ſkill in management, may triumph over the reſt of Europe, in having brought each quality of this noble animal to the higheſt perfection.

In the annals of Newmarket may be found inſtances of horſes that have literally outſtripped the wind, as the celebrated M. Condamine has lately ſhown in his remarks on thoſe of Great Britain. Childers is an amazing inſtance of rapidity; his ſpeed having been more than once exerted equal to 82½ feet in a ſecond, or near a mile in a minute.

The ſpecies uſed in hunting, is a happy combination of the former with others ſuperior in ſtrength, but inferior in point of ſpeed and lineage: an union of both is neceſſary; for the fatigues of the chace muſt be ſupported by the ſpirit of the one, as well as by the vigour of the other.

No country can bring a parallel to the ſtrength and ſize of our horſes deſtined for the draught; or to the activity and ſtrength united of thoſe that form our cavalry. In London, there are inſtances of ſingle horſes that are able to draw on a plain, for a ſmall ſpace, the weight of three tuns; but could with eaſe, and for a continuance, draw half that weight. The pack-horſes of Yorkſhire, employed in conveying the manufactures of that country to the moſt remote parts of the kingdom, uſually carry a burden of 420 pounds; and that indifferently over the higheſt hills of the north, as well as the moſt level roads. But the moſt remarkable proof of the ſtrength of our Britiſh horſes, is to be drawn from that of our mill horſes: ſome of theſe will carry at one load 13 meaſures, which at a moderate computation of 70 pounds each, will amount to 910; a weight ſuperior to that which the leſſer ſort of camels will bear: this will appear leſs ſurpriſing, as theſe horſes are by degrees accuſtomed to the weight; and the diſtance they travel no greater than to and from the adjacent hamlets.

Our cavalry, in the late campaigns (when they had opportunity), ſhowed over thoſe of our allies, as well as of the French, a great ſuperiority both of ſtrength and activity: the enemy was broken through by the impetuous charge of our ſquadrons; while the German horſes, from their great weight and inactive make, were unable to ſecond our efforts; though thoſe troops were actuated by the nobleſt ardour.

The preſent cavalry of this iſland only ſupports its ancient glory. It was eminent in the earlieſt times: our ſcythed chariots, and the activity and good diſcipline of our horſes, even ſtruck terror into Cæſar's legions: and the Britons, as ſoon as they became civilized enough to coin, took care to repreſent on their money the animal for which they were ſo celebrated. It is now impoſſible to trace out this ſpecies; for thoſe which exiſt among the *indigenæ* of Great Britain, ſuch as the little horſes of Wales and Cornwall, the hobbies of Ireland, and the ſhelties of Scotland, though admirably well adapted to the uſes of thoſe countries, could never have been equal to the work of war: but probably we had even then a larger and ſtronger breed in the more fertile and luxuriant parts of the iſland. Thoſe we employ for that purpoſe, or for the draught, are an offſpring of the German or Flemiſh breed, meliorated by our ſoil and a judicious culture.

The Engliſh were ever attentive to an exact culture of theſe animals; and in very early times ſet a high value on their breed. The eſteem that our horſes were held in by foreigners ſo long ago as the reign of Athelſtan, may be collected from a law of that monarch, prohibiting their exportation, except they were deſigned as preſents. Theſe muſt have been the native kind, or the prohibition would have been needleſs; for our commerce was at that time too limited to receive improvement from any but the German kind, to which country their own breed could be of no value. But when our intercourſe with the other parts of Europe was enlarged, we ſoon laid hold of the advantages this gave of improving our breed. Roger de Beleſme, earl of Shrewſbury, is the firſt that is on record: he introduced the Spaniſh ſtallions into his eſtate in Pow-iſland, from which that part of Wales was for many ages celebrated for a ſwift and generous race of horſes. Giraldus Cambrenſis, who lived in the reign of Hen. II. takes notice of it; and Michael Drayton, cotemporary with Shakeſpear, ſings their excellence in the ſixth part of his Polyolbion. This kind was probably deſtined to mount our gallant nobility, or courteous knights for feats of chivalry, in the generous conteſts of the tilt-yard. From theſe ſprung, to ſpeak the language of the times, the flower of courſers, whoſe elegant form added charms to the rider, and whoſe activity and managed dexterity gained him the palm in that field of gallantry and romantic honour.

The increaſe of our inhabitants, and the extent of our manufactures, together with the former neglect of internal navigation to convey thoſe manufactures, multiplied the number of our horſes: an exceſs of wealth, before unknown in theſe iſlands, increaſed the luxury of carriages, and added to the neceſſity of an extraordinary culture of theſe animals: their high reputation abroad has alſo made them a branch of commerce, and proved another cauſe of their vaſt increaſe.

The all-wiſe Creator hath finely limited the ſeveral ſervices of domeſtic animals towards the human race; and ordered that the parts of ſuch, which in their lives have been the moſt uſeful, ſhould after death contribute the leaſt to our benefit. The chief uſe that the *exuviæ* of the horſe can be applied to, is for collars, traces, and other parts of the harneſs; and thus, even after death. he preſerves ſome analogy with his former employ. The hair of the mane is of uſe in making wigs; of the tail, in making the bottoms of chairs, floor-cloths, and chords; and to the angler in making lines.

Plate CLXXXIII. TECHNICAL DESCRIPTION *of the Parts of a* HORSE. *The Fore Part.* 1. The forehead. 2. The temples. 3. Cavity above the eye. 4. The jaw. 5. The lips. 6. The noſtrils. 7. The tip of the noſe. 8. The chin. 9. The beard. 10. The neck. 11. The mane. 12. The fore-top. 13. The throat. 14. The withers. 15. The ſhoulders. 16. The cheſt. 17. The elbow. 18. The arm. 19. The plate vein. 20. The cheſnut. 21. The knee. 22. The ſhank. 23. The main tendents. 24. The fetlock joint. 25. The fetlock. 26. The paſtern. 27. The coronet. 28. The hoof. 29. The quarters. 30. The toe. 31. The heel.—*The Body.* 32. The reins. 33 The fillets. 34. The ribs. 35. The belly. 36. The flanks.—*The Hind Part.* 37. The rump. 38. The tail. 39. The buttocks. 40. The haunches. 41. The ſtifle. 42. The thighs. 43. The hock. 44. The kerb. 45. The point of the hock.

For the breeding, rearing, &c. of horſes, ſee the articles, COLT, HORSE, and STALLION; for the method of training and managing them, ſee HORSEMANSHIP; and for their diſeaſes and cure, ſee FARRIERY.

2. The *Aſinus*, or *Aſs*, has long ſlouching ears, ſhort mane, tail covered with long hairs at the end. The body is uſually of an aſh colour, with a black bar croſs the ſhoulders.

The *Koulan*, or aſs in a wild ſtate (the *onager* of the ancients), varies from the tame in ſeveral reſpects, and requires a more particular deſcription. The forehead is very much arched: the ears are erect, even when the animal is out of order; ſharp-pointed, and lined with whitiſh curling hairs; the irides are of a livid brown; the lips thick; and the end of the noſe ſloping ſteeply down to the upper lip: the noſtrils are large and oval. It is much higher on its limbs than the tame aſs, and its legs are much finer, but it again reſembles it in the narrowneſs of its cheſt and body: it carries its head much higher; and its ſkull is of a ſurpriſing thinneſs. The mane is duſky, about three or four inches long, compoſed of ſoft woolly hair, and extends quite to the ſhoulders: the hairs at the end of the tail are coarſe, and about a ſpan long. The colour of the hair in general is a ſilvery white; the upper part of the face, the ſides of the neck and body, are of a flaxen-colour; the hind part of the thighs are the ſame; the fore part divided from the flank by a white line, which extends round the rump to the tail: the belly and legs are alſo white: along the very top of the back, from the mane quite to the tail, runs a ſtripe of buſhy waved hairs of a coffee-colour, broadeſt above the hind part, growing narrower again towards the tail; another of the ſame colour croſſes it at the ſhoulders (of the males only), forming a mark, ſuch as diſtinguiſhes the tame aſſes: the dorſal band and the mane are bounded on each ſide by a beautiful line of white, well deſcribed by Oppian, who gives an admirable account of the whole. Its winter coat is very fine, ſoft, and ſilky, much undulated, and likeſt to the hair of the camel; greaſy to the touch: and the flaxen colour, during that ſeaſon, more exquiſitely bright. Its ſummer coat is very ſmooth, ſilky, and even, with exception of certain ſhaded rays that mark the ſides of the neck, pointing downwards.

Theſe animals inhabit the dry and mountainous parts of the deſerts of Great Tartary, but not higher than lat. 48. They are migratory, and arrive in vaſt troops to feed, during the ſummer, in the tracts eaſt and north of lake Aral. About autumn they collect in herds of hundreds, and even thouſands, and direct their courſe towards the north of India, to enjoy a warm retreat during winter. But Perſia is their moſt uſual place of retirement: where they are found in the mountains of Caſbin, ſome even at all times of the year. If we can depend on Barboga, they penetrate even into the ſouthern parts of India, to the mountains of Malabar and Golconda. According to Leo Africanus, wild aſſes of an aſh-colour are found in the deſerts of northern Africa. The Arabs take them in ſnares for the ſake of their fleſh. If freſh killed, it is hot and unſavory: if kept two days after it is boiled, it becomes excellent meat. Theſe people, the Tartars and Romans, agreed in their preference of this to any other food: the latter indeed choſe them young, at a period of life in which it was called *Laliſio*; (vide *Martial.* xiii. 97.) The epicures of Rome preferred thoſe of Africa to all others. The grown onagri were introduced among the ſpectacles of the theatre; and their combats were preferred even to thoſe of the elephants.

The manners of the wild aſs are very much the ſame with thoſe of the wild horſe and the dſhikketei. They aſſemble in troops under the conduct of a leader; and are very ſhy. They will, however, ſtop in the midſt of their courſe, and even ſuffer the approach of man at that inſtant, but will then dart away with the rapidity of an arrow diſmiſſed from the bow. This Herodotus ſpeaks to, in his account of thoſe of Meſopotamia; and Leo Africanus, in that of the African.

They are extremely wild. Holy writ is full of alluſions to their ſavage nature. "He ſcorneth the multitude of the city, neither regardeth he the crying of the driver," (Job xxxix. 7.). Yet they are not untameable. The Perſians catch and break them for the draught: they make pits, half-filled with plants to leſſen the fall, and take them alive. They break, and hold them in great eſteem, and ſell them at a high price. The famous breed of aſſes in the eaſt is produced from the koulan reclaimed from the ſavage ſtate, which highly improves the breed. The Romans reckoned the breed of aſſes produced from the onager and tame aſs to excel all others. The Tartars, who kill them only for the ſake of the fleſh and ſkins, lie in ambuſh and ſhoot them. They have been at all times celebrated for their amazing ſwiftneſs; for which reaſon the Hebreans called them *Pere;* as they ſtyled them *Arod* from their braying. Their food is the ſalteſt plants of the deſerts, ſuch as the kalis, atriplex, chenopodium, &c.; and alſo the bitter milky tribe of herbs: they alſo prefer ſalt-water to freſh. This is exactly conformable to the hiſtory given of this animal in the book of Job; for the words "barren land", expreſſive of its dwelling, ought, according to the learned Bochart, to be rendered "ſalt places." The hunters lie in wait for them near the ponds of brackiſh water, to which they reſort to drink: but they are not of a thirſty nature, and ſeldom have recourſe to water. Theſe animals were anciently found in the Holy Land, Syria, the land of Uz or Arabia Deſerta, Meſopotamia, Phrygia, and Lycaonia. But at preſent they are entirely confined to the countries above mentioned. Chagrin, a word derived from the Tartar ſoghré, is made of the ſkin of theſe animals, which grows about the rump, and alſo thoſe of horſes, which is equally good. There are great manufactures of it at Aſtracan and in all Perſia. It is a miſtake to ſuppoſe it to be naturally granulated, for its roughneſs is entirely the effect of art. The Perſians uſe the bile of the wild aſs as a remedy againſt the dimneſs of ſight: and the ſame people, and the Nogayan Tartars, have been known to endeavour the moſt infamous beſtialities with it, in order to free themſelves from the diſorders of the kidneys.

The tame or *domeſtic aſs*, is a humble, patient, and tranquil, animal. He ſubmits with firmneſs to ſtrokes and chaſtiſement: he is temperate both as to the quantity and quality of his food; he contents himſelf with the rigid and diſagreeable herbage which the horſe and other animals leave to him and diſdain to eat: he is more delicate with regard to his drink, never uſing water unleſs it be perfectly pure. As his maſter does not take the trouble of combing him, he often rolls himſelf on the turf among thiſtles, ferns, &c. Without regarding what he is carrying, he lies down to roll as often as he can, ſeeming to reproach his maſter for neglect and want of attention. When very young, the aſs is a gay, ſprightly, nimble, and gentle animal. But he ſoon loſes theſe qualities, probably by the bad uſage he meets with; and becomes lazy, untractable, and ſtubborn. When under the influence of love, he becomes perfectly furious. The affection of the female for her young is ſtrong: Pliny aſſures us, that when an experiment was made to diſcover the ſtrength of maternal affection in a ſhe-aſs, ſhe run through the flames in order to come at her colt. Although the aſs be generally ill uſed, he diſcovers a great attachment to his maſter; he ſmells him at a diſtance, ſearches the places and roads he uſed to frequent, and eaſily diſtinguiſhes him from the reſt of mankind. The aſs has a very fine eye, an excellent ſcent, and a good ear. When overloaded, he hangs his head, and ſinks his ears: when too much teazed or tormented, he opens his mouth and retracts his lips in a diſagreeable manner, which gives him an air of ridicule and deriſion. If you cover his eyes, he will not move another ſtep; if you lay him on his ſide, and place his head ſo that one eye reſts on the ground, and cover the other with a cloth, he will remain in this ſituation without making any attempt to get up. He walks, trots, and gallops in the ſame manner as the horſe; but all his motions are ſlower. Whatever be the pace he is going at, if you puſh him, he inſtantly ſtops.

The cry of the horſe is known by the name of *neighing;* that of the aſs, by *braying*, which is a long, diſagreeable noiſe, conſiſting of alternate diſcords from ſharp to grave and from grave to ſharp; he ſeldom cries but when preſſed with hunger or love: the voice of the female is clearer and more piercing than that of the male.

The aſs is leſs ſubject to vermin than other animals covered with hair; he is never troubled with lice, probably owing to the hardneſs and dryneſs of his ſkin; and it is probably for the ſame reaſon that he is leſs ſenſible to the whip and ſpur than the horſe. The teeth of the aſs fall out and grow at the ſame age and in the ſame manner as thoſe of the horſe; and he has nearly the ſame marks in his mouth.

Aſſes are capable of propagating when two years old. The females are in ſeaſon during the months of May and June. The milk appears in the dugs ten months after impregnation; ſhe brings forth in the twelfth month, and always one at a time. Seven days after the birth, the ſeaſon of the female returns, and ſhe is again in a condition to receive the male. The colt ſhould be taken from her at the end of five or ſix months, that the growth and nouriſhment of the fetus may not be obſtructed. The ſtallion or jack-aſs ſhould be the largeſt and ſtrongeſt that can be found; he ſhould be at leaſt three years old, and never ought to exceed ten. The aſs, like the horſe, takes three or four years in growing, and lives till he be 25 or 30: he ſleeps leſs than the horſe, and never lies down to ſleep but when exceſſively fatigued. He is more robuſt, and leſs ſubject to diſeaſes, than the horſe.

Travellers inform us that there are two ſorts of aſſes in Perſia; one of which is uſed for burdens, they being ſlow and heavy: the other is kept like horſes for the ſaddle; for they have ſmooth hair, carry their head well, and are much quicker in their motion; but when they ride them, they ſit nearer their buttocks than when on a horſe: they are dreſſed like horſes, and are taught to amble like them; but they generally cleave their noſtrils to give them more room for breathing. Dr Ruſſel likewiſe tells us they have two ſorts in Syria; one of which is like ours; and the other very large, with remarkable long ears; but they are both put to the ſame uſe, which is, to carry burdens.

In America there were originally no aſſes at all, nor yet horſes: but they were carried thither long ago, at firſt by the Spaniards, and afterwards by other nations, where they multiplied greatly; inſomuch, that, in ſome places, there are whole droves of them that run wild, and are very hard to be caught. Aſſes in general carry the heavieſt burdens in proportion to their bulk; and, as their keeping coſts little or nothing, it is a great wonder that they are not put to more uſes than they generally are among us. The fleſh of the common aſs is never eaten in theſe parts of the world; though ſome pretend their colts are tender, and not diſagreeable.

3. The *Hemionus* of Pallas, or Wild Mule, is of the ſize and appearance of the common mule; with a large head, flat forehead growing narrow toward the noſe, eyes of a middle ſize, the irides of an obſcure aſh-colour; 38 teeth in all, being two in number fewer than in a common horſe; ears much longer than thoſe of a horſe, quite erect, lined with a thick whitiſh curling coat; neck ſlender, compreſſed; mane upright, ſhort, ſoft, of a greyiſh colour; in place of the foretop, a ſhort tuft of downy hair about an inch and three quarters long. The body is rather long, and the back very little elevated; the breaſt protuberant and ſharp. The limbs are long and elegant; the thighs thin, as in a mule's. Within the fore-legs there is an oval callus; in the hind legs none. The hoofs are oblong, ſmooth, and black; the tail is like that of a cow, ſlender, and for half of its length naked, the reſt covered with long aſh-coloured hairs. Its winter coat grey at the tips, of a browniſh aſh-colour beneath; about two inches long, in ſoftneſs like the hair of a camel, and undulated on the back. Its ſummer coat is much ſhorter, of a moſt elegant ſmoothneſs, and in all parts marked moſt beautifully with ſmall vortexes. The end of the noſe is white; from thence to the foretop inclining to tawny. The buttocks are white; as are the inſide of the limbs and belly. From the mane a blackiſh teſtaceous line extends along the top of the back to the tail, broadeſt on the loins, and growing narrower towards the tail. The colour of the upper part of the body is a light yellowiſh grey, growing paler towards the ſides. The length, from the tip of the noſe to the baſe of the tail, is ſix feet ſeven inches; length of the trunk of the tail one foot four; of the hairs beyond the end, eight inches. The height of the animal is three feet nine. This ſpecies inhabits the deſerts between the rivers Onon and Argun in the moſt ſouthern part of Siberia, and extends over the vaſt plains and deſerts of weſtern Tartary, and the celebrated ſandy deſert of Gobi, which reaches even to India. In Siberia they are ſeen only in ſmall numbers, as if detached from the numerous herds to the ſouth of the Ruſſian dominions. In Tartary they are particularly converſant about Tarienoor, a ſalt lake at times dried up. They ſhun wooded tracts and lofty ſnowy mountains. They live in ſeparate herds, each conſiſting of a chief, a number of mares and colts, in all to the number of about 20; but ſeldom ſo many, for commonly each male has but five and ſometimes fewer females. They copulate towards the middle or end of Auguſt; and bring for the moſt part but one at a time, which by the third year attains its full growth, form, and colour. The young males are then driven away from their paternal herds, and keep at a diſtance till they can find mates of their own age which have quitted their dams. Theſe animals always carry their heads horizontally; but when they take to flight, hold them upright, and erect their tail. Their neighing is deeper and louder than that of a horſe. They fight by biting and kicking, as uſual with the horſe: they are fierce and untameable; and even thoſe which have been taken young, are ſo intractable as not to be broken by any art which the wandering Tartars could uſe. Yet was it poſſible to bring them into fit places, and to provide all the conveniencies known in Europe, the taſk might be effected: but it is doubted whether the ſubdued animal would retain the ſwiftneſs it is ſo celebrated for in its ſtate of nature. It exceeds that of the antelope; it is even proverbial; and the inhabitants of Thebet, from the fame of its rapid ſpeed, mount on it Chammo their god of fire. The Mongalians deſpair of ever taking them by the chace; but lurk behind ſome tomb, or in ſome ditch, and ſhoot them when they come to drink or eat the ſalt of the deſert. They are exceſſively fearful animals, and provident againſt danger. A male takes on him the care of the herd, and always is on the watch. If they ſee a hunter, who by creeping along the ground has got near them, the centinel takes a great circuit, and goes round and round him, as diſcovering ſomewhat to be apprehended. As ſoon as the animal is ſatisfied, it rejoins the herd, which ſets off with great precipitation. Sometimes its curioſity coſts it its life; for it approaches ſo near as to give the hunter an opportunity of ſhooting it. But it is obſerved, that in rainy or in ſtormy weather, theſe animals ſeem very dull, and leſs ſenſible of the approach of mankind. The Mongalians and Tunguſi, according to Du Halden, kill them for the ſake of the fleſh, which they prefer to that of horſes, and even to that of the wild boar, eſteeming it equally nouriſhing and wholeſome. The ſkin is alſo uſed for the making of boots. Their ſenſes of hearing and ſmelling are moſt exquiſite: ſo that they are approached with the utmoſt difficulty. The Mongalians call them *dſhikketaei*, which ſignifies "the eared;" the Chineſe, *yo to tſe*, or "mule." In ancient times the ſpecies extended far to the ſouth. It was the hemionos or half aſs of Ariſtotle, found in his days in Syria, and which he celebrates for its amazing ſwiftneſs and its fecundity, a breeding mule being thought a prodigy; and Pliny, from the report of Theophraſtus, ſpeaks of this ſpecies being found in Cappadocia, but adds they were a particular kind.

The domeſtic mules of preſent times (*equus mulus* of Geſner and Linnæus) are the offspring of the horſe and the aſs, or aſs and mare; are very hardy, and have more the form and diſpoſition of the aſs than the horſe. The fineſt are bred in Spain; very large ones in Savoy.

4. The Zebra. This animal has the figure and gracefulneſs of the horſe, joined to the ſwiftneſs of the ſtag. He is about ſeven feet long, from the point of the muzzle to the origin of the tail, and about four feet high. The colour of his ſkin is beautiful and uniform, conſiſting of alternate parallel rings of black and white, diſpoſed in the moſt regular manner, as repreſented in the plate. He is generally leſs than the horſe and larger than the aſs. The zebra is found no where but in the eaſtern and ſouthern provinces of Africa, from Ethiopia to the Cape of Good Hope, and from the Cape of Good Hope to Congo. The Dutch have been at great pains to tame and uſe them for domeſtic purpoſes, but with little ſucceſs. He is hard-mouthed, and kicks when any perſon attempts to touch or come near him. He is reſtleſs and obſtinate as a mule: but perhaps the wild horſe is naturally as

untractable as the zebra; for it is probable, if he were early accuſtomed to obedience and a domeſtic life, he would become as docile as the horſe.

5. The quacha, or quagga, is ſtriped like the former on the head and body, but with fewer lines. The flanks are ſpotted; the rump is plain; the ground colour of the head, neck, body, and rump, a bright bay: the belly, thighs, and legs are white, and free from all marks. This ſpecies, till of late, has been ſuppoſed to be the female of the zebra; but recent obſervations prove that the male and female zebra are marked alike. This differs likewiſe in being thicker and ſtronger made, and in being more tractable; for inſtance, one had been ſo far broken as to draw in a cart. The Hottentots alſo diſtinguiſh them from the former, by the names of *quagga* and *opeagha*.

ERA, in chronology. See Æra.

ERANARCHA, a public officer among the ancient Greeks. whoſe buſineſs was to preſide over and direct the alms and proviſions made for the poor. Cornelius Nepos, in his life of Epaminondas, deſcribes his office thus: When any perſon was reduced to poverty, taken captive, or had a daughter to marry, which he could not effect for want of money, &c. the eranarcha called an aſſembly of friends and neighbours, and taxed each according to his means and eſtate, to contribute towards his relief.

ERANTHEMUM, in botany: A genus of the monogynia order, belonging to the diandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The corolla is quinqueſid, with the tube ſiliform; the antheræ without the tube; the ſtigma ſimple.

ERASISTRATUS, a celebrated phyſician, grandſon to the philoſopher Ariſtotle. He diſcovered by the motion of the pulſe the love which Antiochus had conceived for his mother-in-law Stratonice, and was rewarded with 100 talents for the cure by the father of Antiochus. He was a great enemy to bleeding and violent phyſic.

ERASMUS (Deſiderius), born at Rotterdam in 1467. He loſt his father and mother at 14 years of age; and was committed to the care of certain guardians, who would force him to be an eccleſiaſtic, which he refuſed for a long time. However, he was obliged to aſſume the religious habit among the canons regular in the monaſtery of Stein near Tergou; but afterwards obtained a diſpenſation from his vows. He was the moſt learned man of the age in which he lived; and contributed, by his example and his writings, to the reſtoration of learning in the ſeveral countries in which he occaſionally reſided, viz. Italy, Switzerland, Holland, France, and England: with the laſt, he was moſt ſatisfied; and found the greateſt encouragement from Henry VIII. Sir Thomas More, and all the learned Engliſhmen of thoſe days. He publiſhed a great many books; and died at Baſil in 1536. He was buried honourably, and his memory is ſtill held in veneration. He had, however, many enemies; and as he did not embrace the reformation, and yet cenſured many things in popery, he hath been treated injuriouſly both by Catholics and Proteſtants. The works of Eraſums in 10 vols folio were publiſhed at Leyden in 1706, in a very handſome manner, under the care of M. Le Clerc. Dr Jortin publiſhed his life in one vol. 4to, 1758.

ERASTIANS, a religious ſect or faction which aroſe in England during the time of the civil wars in 1647, thus called from their leader Thomas Eraſtus, whoſe diſtinguiſhing doctrine it was, that the church had no right to diſcipline, that is, no regular power to excommunicate, exclude, cenſure, abſolve, decree, or the like.

ERATO (from ερω *I love*), in mythology, the name of one of the nine muſes who preſided over love-poetry. To this muſe ſome have aſcribed the invention of the lyre and lute; and ſhe is repreſented with a garland of myrtles and roſes, holding a lyre in one hand and a bow in the other, and at her ſide a Cupid with his torch. There is alſo a Nereid of the ſame name.

ERATOSTHENES, a Cyrenæan philoſopher, hiſtorian, and poet; called for his learning *Plato Minor*. He was keeper of the famous library at Alexandria; and was greatly in favour with Ptolemy Euergetes, by whoſe order he wrote a hiſtory of the Theban kings of Egypt, which ſucceſſion was entirely omitted by Manetho. He thus fixed the Egyptian chronology, and his authority is by many preferred to that of Manetho. He wrote many other things, a catalogue of which is to be ſeen in Fabricius, Voſſius, &c. but his only piece now remaining entire is a deſcription and fabulous account of the ſtars. He ſtarved himſelf in old age through grief for the dimneſs of his ſight, about the 10th or 12th year of Ptolemy Epiphanes, 194 B. C.

ERATOSTRATUS, an Epheſian who burnt the famous temple of Diana the ſame night that Alexander the Great was born. This burning, as ſome writers have obſerved, was not prevented or ſeen by the goddeſs of the place, who was then preſent at the labours of Olympias, and at the birth of the conqueror of Perſia. Eratoſtratus did this villany merely to eternize his name by ſo uncommon an action.

EREBUS (Ερεβος, from ערב *night)*, in mythology, a term denoting darkneſs. According to Heſiod, Erebus was the ſon of Chaos and the night, and the father of the day. This was alſo the name of part of the *inferi* among the ancients: they had a peculiar expiation for thoſe who were detained in Erebus.

Erebus was properly the gloomy region, and diſtinguiſhed both from Tartarus the place of torment, and Elyſium the region of bliſs: according to the account given of it by Virgil, it forms the third grand diviſion of the inviſible world beyond the Styx, and comprehends ſeveral particular diſtricts, as the *limbus infantum*, or receptacle for infants; the *limbus* for thoſe who have been put to death without cauſe; that for thoſe who have deſtroyed themſelves; the fields of mourning, full of dark groves and woods, inhabited by thoſe who died for love; and beyond theſe, an open champaign country for departed warriors.

ERECTION, in a general ſenſe, the art of raiſing or elevating any thing; as the erection of a perpendicular, &c. It is alſo uſed in a figurative ſenſe; as the erection of a biſhopric, marquiſate, &c.

Erection is particularly uſed by medical writers for the ſtate of the penis when ſwelled and diſtended by the action of the muſcles called *erectores*. See Anatomy, p. 739.

There is alſo an erection of the clitoris which is performed by muſcles for that purpoſe.

EREMIT. See Hermit.

ERETRIA (anc. geog.), a town of Eubœa, ſituated on the Euripus, in the ſouth-weſt of the iſland. A very ancient city, and the largeſt of the iſland, after Chalcis. After being demoliſhed by the Perſians, it was reſtored on an adjoining ſpot, according to Strabo, who mentions a ſchool of Eretrian philoſophers there. The Abantes of Homer were of Eubœa.

ERFORT, a town of Germany, in the circle of Upper Saxony, the capital of Thuringia, and ſubject to the elector of Mentz. It is defended by good ramparts; and has a caſtle on an eminence, which commands the town. Its inhabitants are almoſt all Lutherans, but its principal churches belong to the Catholics. There are ſeveral handſome ſtructures, both public and private; but the houſes in general are but indifferently built. E. Long. 11. 14. N. Lat. 50. 49.

ERGASTULUM, among the Romans, was a priſon, work-houſe, or houſe of correction, where ſlaves by the private authority of their maſters were confined and kept for their offences to hard labour. The Greeks had a place of confinement of this ſort called Σωφρονιςηριον.

ERGOT, in farriery, is a ſtub, like a piece of ſoft horn, about the bigneſs of a cheſnut, placed behind and below the paſtern-joint, and commonly hid under the tuft of the fetlock.

ERICA, heath, in botany: A genus of the monogynia order, belonging to the octandria claſs of plants; and in the natural method ranking under the 18th order, *Bicornes*. The calyx is tetraphyllous; the corolla quadrifid; the filaments inſerted into the receptacle; the antheræ bifid; the capſule quadrilocular. Of this there are four ſpecies, natives of Britain; which are ſo well known, that no deſcription needs be given of them. In the Highlands of Scotland this plant is made ſubſervient to a great variety of purpoſes. The poorer inhabitants make walls for their cottages with alternate layers of heath and a kind of mortar made of black earth and ſtraw. The woody roots of the heath are placed in the centre; the tops externally and internally. They make their beds of it, by placing the roots downwards; and the tops only being uppermoſt, they are ſufficiently ſoft to ſleep upon. Cabbins are alſo thatched with it. In the iſland of Ilay, ale is frequently made by brewing one part of malt and two of the tops of young heath; ſometimes adding hops. Boethius relates, that this liquor was much uſed by the Picts. Woollen cloth boiled in alum water, and afterwards in a ſtrong decoction of heath-tops, comes out of a fine orange colour. The ſtalks and tops will tan leather. Beſoms and faggots to burn in ovens are alſo made of this plant. It is alſo uſed for filling up drains that are to be covered over. Sheep and goats will ſometimes eat the tender ſhoots, but they are not fond of them. Cattle not accuſtomed to feed on heath, give bloody milk; but they are ſoon relieved by drinking plentifully of water. Horſes will eat the tops. Bees extract a great deal of honey from the flowers; and, where heath abounds, the honey has a reddiſh caſt. There are many exotic ſpecies with which our green-houſe collections are enriched and adorned, as the triflora, tubiflora, auſtralis, &c.

ERIDANUS (anc. geog.) a river of Attica, falling into the Iliſſus.—Another Eridanus, the more ancient name of the Padus, an appellation aſcribed by Pliny to the Greeks; followed in this by Virgil. It riſes in mount Veſulus, in the Alpes Cottiæ, and dividing the Ciſalpine Gaul into the Ciſpadana and Tranſpadana, and ſwelled on each hand with no inconſiderable rivers from the other Alps and the Apennine, falls at ſeven mouths into the Adriatic. Famous in mythology, from the ſtory of Phaëton; whoſe ſiſters, the Heliades, were here changed into poplars, according to Ovid.

Eridanus, in aſtronomy, a conſtellation of the ſouthern hemiſphere, in form of a river.—The ſtars in the conſtellation Eridanus, in Ptolemy's catalogue, are 34; in Tycho's, 19; and in the Britiſh Catalogue, 84.

ERIE, a vaſt lake to the weſtward of Pennſylvania, in North America, ſituated between 80° and 87° W. Long. and between 41° and 42° N. Lat.

ERIGENA, or Scotus, (John), a famous ſcholaſtic divine, born about the beginning of the ninth century; but where, is a matter of diſpute among authors. Bale and Pits ſay he was born at St David's in Wales; Dempſter, Mackenzie, and Henry, that he was born at Ayr in Scotland; which they infer from his names *Erigina* and *Scotus*, by the latter of which he was generally diſtinguiſhed by his cotemporary writers. But Du Pin and Sir James Ware aſſert that he was by birth an Iriſhman; Ireland being in thoſe days called *Scotia*, and by the natives *Erin*. They agree, however, in relating that he travelled to Athens, where he acquired a competent knowledge of the Greek and other oriental languages; and that he afterwards reſided many years in the court of Charles the Bald, king of France, who, on account of his ſingular abilities, treated him as his intimate friend and companion. He ſlept frequently in the royal apartment; and was conſtantly admitted to the king's table. "We may judge (ſays a modern hiſtorian) of the freedom which he uſed with Charles, by the following repartee. As the king and Scotus were ſitting one day at table, oppoſite to each other, after dinner, drinking a cheerful glaſs, the philoſopher having ſaid ſomething that was not quite agreeable to the rules of French politeneſs, the king in a merry humour aſked him, Pray what is between a *Scot* and a *ſot?* To which he anſwered, "Nothing but the table." See *Henry's Hiſtory of Great Britain*, vol. I. p. 344. who quotes this ſtory from *Hovedeni Annal. ad an.* 86. Quer. What language were they talking when this *bon mot* was uttered?

During his reſidence with Charles, he wrote ſeveral books of ſcholaſtic divinity; which, though abſurd enough, were at that time not ſufficiently ſo to ſecure him from the imputation of heterodoxy; and on that account the pope commanded Charles the Bald to ſend him to Rome; but the king had too great a regard for his companion to truſt him with his holineſs. One of the chief controverſies in which Scotus was engaged, and with which the pope was much offended, was concerning the real preſence and blood of Chriſt in the wafer. His opinion of this weighty matter is expreſſed in theſe few words: "What we receive corporally is not the body of our Lord; but that which feeds the ſoul and is only perceived by faith." He was alſo engaged in two other controverſies of equal importance, but of a ſomewhat leſs delicate nature. The firſt was, Whether any part of the euchariſt be evacuated by ſtool? and the ſecond, Whether Chriſt was born of the Virgin Mary *aperta vulva*; Paſchaſius was of opinion, that this could not be without ſome injury to her perpetual virginity; and therefore believed that Chriſt came into the world *per vulvam clauſam*, as he came into the place where his diſciples were aſſembled, through the door and not through the wall, without opening the door. Concerning the firſt of theſe delicate queſtions, Scotus with ſeveral others declared, that part of the euchariſt was certainly evacuated by ſtool; for which they were honoured with the appellation of *Stercoriſts*. And as to the ſecond queſtion, he ſaid, that the *vulva clauſa* was a dangerous opinion: for it would thence follow, that he was not born, but iſſued; *non eſt naſci, ſed erumpi*. See Mackenzie, vol. I. p. 55.

Whether this John Scotus returned to England, or ended his days in France, is a matter of doubt. Some of our hiſtorians tell us, that he left France in the year 864; and that, after reſiding about three years in Oxford, he retired to the abbey of Malmſbury, where his ſcholars ſtabbed him with their pen-knives. There is no foundation for this ſtory. Probably he died about the year 874; but whether in France or England, is uncertain, and of little importance. Some have related, that he was invited to England by king Alfred: but in this they confound him with John, abbot of Etheling, who was aſſaſſinated in 895; and to this miſtake the various accounts concerning this author are to be attributed. Regardleſs of his hiſtory, he appears from his writings to have been a man of parts, and, in point of learning, ſuperior to any of his cotemporaries. He wrote, 1. *De diviſione naturæ*, lib. v. 2. *De prædeſtinatione Dei*. 3. *Excerpta de differentiis & ſocietatibus Græci Latinique verbi*. 4. *De corpore et ſanguine Domini*. 5. *Ambigua S. Maximi ſeu ſcholia ejus in difficiles locos S. Gregorii Nazianzeni, Latine verſa*. 6. *Opera S. Dionyſii quatuor in Latinam ling. converſa*. All publiſhed. 7. *De viſione Dei*, and ſeveral other works, in manuſcript, preſerved in different libraries.

ERIGERON, FLEA-BANE, in botany: A genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is naked; the pappus hairy; the florets of the radius are linear, and very narrow. There are five ſpecies; of which the moſt remarkable is the viſcoſum, or male flea-bane of Theophraſtus, and greater flea-bane of Dioſcorides. It is a native of the ſouth of France and Italy; and hath a perennial root, from whence ariſe many upright ſtalks near three feet high. The leaves in warm weather ſweat out a clammy juice; the flowers are produced ſingle upon pretty long footſtalks, are of a yellow colour, and have an agreeable odour. The plants are eaſily propagated by ſeeds; and thrive beſt in a dry ſoil and ſunny expoſure.

ERIGONE, in fabulous hiſtory, daughter to Icarius, died of grief for her father's death, was tranſlated into heaven, and makes the ſign Virgo.

Plate CLXXXV.

ERINACEUS, or HEDGEHOG, in zoology; a genus of quadrupeds belonging to the order of feræ, the characters of which are theſe: They have two fore-teeth in the upper jaw, at a conſiderable diſtance from one another, and two in the under jaw, leſs diſtant; and they have two recumbent dog-teeth, one on each ſide. The hedge-hog has a very uncommon method of defending himſelf from the attacks of other animals: being poſſeſſed of little ſtrength or agility, he does not attempt to fly from or aſſail his enemies; but erects his briſtles, and rolls himſelf up like a ball, expoſing no part of his body that is not furniſhed with ſharp weapons of defence; he will not unfold himſelf, unleſs thrown into water: the more he is frightened or haraſſed, the cloſer he ſhuts himſelf up; and frequently diſcharges his urine, which has a very fetid and lothſome ſmell. While in this ſtate, moſt dogs, inſtead of biting him, ſtand off and bark, not daring to ſeize him; or, if they attempt it once, their mouths are ſo prickled with his briſtles, that they cannot be prevailed upon to attempt it a ſecond time. Both the male and female are covered with briſtles from the head to the tail. Theſe briſtles are of great uſe in defending them from other animals; but muſt be very inconvenient when they incline to copulate. This operation they cannot perform in the manner of other quadrupeds; but do it face to face, either ſtanding on end, or the female lying on her back. The females come in ſeaſon in the ſpring, and bring forth their young in the beginning of ſummer. They commonly bring forth three or four, and ſometimes five at a time. The young ones are of a whitiſh colour, and only the points of the briſtles appear above the ſkin. It is impoſſible to tame them: the mother and her young have frequently been confined together, and furniſhed with plenty of proviſions; but, inſtead of nouriſhing them, ſhe uniformly devoured them one after another. Males and females have likewiſe been kept in one apartment, where they lived, but never copulated. Hedge-hogs feed upon fallen fruits, ſome roots, and inſects: they are very fond of fleſh-meat, whether raw or roaſted. They frequent woods, and live under the trunks of old trees, in the chinks of rocks, or under large ſtones. Naturaliſts allege, that they go into gardens, mount the trees, and come down with pears, apples, or plums, ſtuck upon their briſtles. But this is a miſtake: although kept in a garden, they never attempt to climb trees, or ſtick even fallen fruit upon their briſtles, but lay hold of their food with their mouth. They never come out of their holes in the day, but go about in queſt of food during the night. They eat but little, and can live very long without taking any nouriſhment. They do not lay up any ſtore of proviſions in harveſt; ſuch an inſtinct would be uſeleſs, as they ſleep all the winter. They lie under the undeſerved reproach of ſucking cattle and hurting their udders; but the ſmallneſs of their mouth renders that impoſſible. There are three ſpecies, viz.

1. The europæus, or common hedgehog, with round ears, and creſted noſtrils. It is about nine inches long; the upper part of the body is totally covered with ſharp prickles, and the under part is covered with hair. The hedgehog, even when ſtanding on

his legs, has a very ugly aſpect. His body is an oblong maſs, convex above, terminated on the fore-part by a very ſharp muzzle, and mounted on four ſhort legs, of which nothing appears but the feet, and the tail is not diſcernible. His ears are broad, round, and ſhort; and his eyes are ſmall and protuberant. The length of his body, from the point of the muzzle to the anus is about nine inches.—2. The inauris, or white hedge-hog, has no external ears. It is a native of America. 3. The malaccenſis has hanging ears, and is a native of Aſia.

ERINGO, in botany. See Eryngium.

ERINUS, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ*. The calyx is pentaphyllous; the limb of the corolla quinquefid and equal; with its lobes emarginated, and the upper lip very ſhort and reflexed; the capſule bilocular. There are ſix ſpecies, none of them natives of Britain. They grow from two inches to four feet in height, and are adorned with flowers of a white or purple colour. They are propagated by ſeeds, but in this country generally require to be kept in a ſtove.

ERIOCAULON, in botany: A genus of the trigynia order, belonging to the triandria claſs of plants; and in the natural method ranking with the ſixth order, *Enſatæ*. The common calyx is an imbricated capitulum or knob; there are three equal petals; and the ſtamina are on the germen.

ERIOCEPHALUS, in botany: A genus of the polygamia neceſſaria order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is ſomewhat villous; there is no pappus; the calyx is decaphyllous and equal; the radius has five florets.

ERIOPHORUM, in botany: A genus of the monogynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the third order, *Calamariæ*. The glumes are paleaceous and imbricated all round; there is no corolla; and only one ſeed furniſhed with a very long down.

ERITHALIS, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The corolla is quinquepartite; the calyx urceolated or bladder-like, the berry decemlocular inferior.

ERIVAN, a city of Perſia, in Aſia, and capital of Perſian Armenia. It is a large, dirty, ill-looking place, in which are no handſome buildings, the houſes being very mean, and raiſed with earth or mud; but it is full of gardens or vineyards. It is ſituated in a plain which is ſurrounded on all ſides with mountains. Two rivers paſs near it, the Zengui to the north-weſt, and the Queur Boulac to the ſouth-weſt. The fortreſs may paſs for a town of itſelf; it is of an oval form, and is four miles in circumference, containing about 800 houſes. It is inhabited by none but the native Perſians. The Armenians have ſhops in it, where they work and trade in the day-time, but at night return to their habitations in the city. The fortreſs is ſurrounded with three walls, made with bricks dried in the ſun, which have battlements, and are flanked with towers, and defended with ramparts. On the north-eaſt there is a dreadful precipice, above 200 yards in depth, at the bottom of which the river runs. The garriſon uſually conſiſted of 2000 men; but how many there are ſince the revolution, is hard to ſay. The palace of the governor of the province is within the fortreſs. The city is about a cannon's ſhot diſtant from the fortreſs, and the ſpace between is full of houſes and markets. E. Long. 44. 50. N. Lat. 40. 20.

ERIPHYLE (fab. hiſt.), a ſiſter of Adraſtus king of Argos, who married Amphiaraus. She was daughter of Talaus and Liſimache. When her huſband concealed himſelf that he might not accompany the Argives in their expedition againſt Thebes, where he knew he was to periſh, Eriphyle ſuffered herſelf to be bribed by Polynices with a golden necklace which had been formerly given to Hermione by the goddeſs Venus, and ſhe diſcovered where Amphiaraus was. This treachery of Eriphyle compelled him to go to the war; but before he departed, he charged his ſon Alcmæon to murder his mother as ſoon as he was informed of his death. Amphiaraus periſhed in the expedition; and his death was no ſooner known than his laſt injunctions were obeyed, and Eriphyle was murdered by the hands of her ſon.

ERIS, the goddeſs of diſcord among the Greeks. She is the ſame as the *Diſcordia* of the Latins.

ERISICHTHON (fab. hiſt.), a Theſſalian, ſon of Triops, who derided Ceres and cut down her groves. This impiety irritated the goddeſs, who afflicted him with continual hunger. He ſquandered all his poſſeſſions to gratify the cravings of his appetite, and at laſt he devoured his own limbs for want of food. Some ſay that his daughter had the power of transforming herſelf into whatever animal ſhe pleaſed, and that ſhe made uſe of that artifice to maintain her father, who ſold her, after which ſhe aſſumed another ſhape, and became again his property.

ERMIN, in zoology. See Mustela.

Ermin, or *Ermine*, in heraldry, denotes a white field or fur, powdered or interſperſed with black ſpots, called *powdering*. It is ſuppoſed to repreſent the ſkin of an animal of the ſame denomination (ſee Mustela). There is however no animal whoſe ſkin naturally correſponds to the herald's ermin.

The animal is milk white; and ſo far is it from having ſpots, that tradition reports, that it will rather die or be taken than ſully its whiteneſs. Whence its ſymbolical uſe.

But white ſkins having for many ages been uſed for the linings of the robes of magiſtrates and great men; the furriers at length, to add to their beauty, uſed to ſew bits of the black tails of thoſe creatures upon the white ſkins, to render them the more conſpicuous. Which alteration was introduced into armoury.

The ſable ſpots in ermin are not of any determinate number, but they may be more or leſs at the pleaſure of the painter or furrier.

Ermin, an order of knights, inſtituted in 1450 by Francis I. duke of Bretagne, and formerly ſubſiſting in France. The collar of this order was of gold, compoſed of ears of corn in ſaltier; at the end of which hung the ermin, with this inſcription, *a ma vie*. But the order expired when the dukedom of Bretagne was annexed to the crown of France.

ERMINES, in heraldry, the reverſe of ermine, i. e. white ſpots on a black field.

ERMINITES, in heraldry, ſhould ſignify little ermines, but it is otherwiſe; for it ſignifies a white field powdered with black, only that every ſuch ſpot hath a little red hair on each. Erminites alſo ſignify a yellow field powdered with black, which the French expreſs much better by *or ſemée d'ermine de ſable*.

ERMINOIS, in heraldry, ſignifies the field or, and the ſpots black.

EROORO, in ornithology See ALCEDO, of which it is a ſpecies.

EROS (of ερως "love"), in mythology, one of two chiefs over all the other Cupids, being the cauſe of love. See ANTEROS.

EROTIA, a feſtival in honour of Eros the god of love. It was celebrated by the Theſpians every fifth year with ſports and games, when muſicians and others contended If any quarrels or ſeditions had ariſen among the people, it was then uſual to offer ſacrifices and prayers to the god, that he would totally remove them.

EROTIC (derived from ερως "love;" whence ερωτικος), is applied to any thing which has a relation to the paſſion of love.

In medicine we find the phraſe *delirium eroticum* uſed for a kind of melancholy contracted through exceſs of love.

EROSION, among phyſicians, denotes much the ſame with CORROSION, only in a ſtronger degree.

EROTESIS. See ORATORY, n° 94.

ERPENIUS (Thomas), in Dutch THOMAS of ERFE; a celebrated profeſſor of the Arabic language, was born at Gorcum in Holland, in 1584. and educated at Leyden. He applied himſelf to the oriental languages at the perſuaſion of Joſeph Scaliger; and afterwards travelled into England, France, Italy, and Germany, and every where obtained the eſteem of the learned. On his return to Holland, he was made profeſſor of Arabic in the univerſity of Leyden, and died there in 1624. He publiſhed a great many excellent works, which ſpread his reputation through the whole learned world. It is ſaid, that the king of Morocco admired ſo greatly the letters Erpenius wrote to him in Arabic in the name of the United Provinces, that he could not ceaſe reading them, and ſhowing them to thoſe who ſpoke that language naturally.

ERRATIC, in general, ſomething that wanders, or is not regular: hence it is the planets are called *erratic ſtars*.

ERRHINES, in pharmacy, medicines which when ſnuffed up the noſe promote a diſcharge of mucus from that part.

Among the milder kinds of the errhines we may reckon marjoram, baſilicon, thyme, hyſſop, ſavory, marum ſyriacum, the tops of origanum, flowers of lilies of the valley, and gum benzoin, the reſin of guaiacum, fine raſpings of aloes wood, dry volatile ſalt of ſal ammoniac perfumed with oil of marjoram, as alſo white vitriol. On the contrary, violent errhines are, euphorbium, the powder of white hellebore, and, in a milder degree, ſeveral ſorts of ſnuffs, precipitate mercury, and pepper.

Errhines are more friendly to the conſtitution and nerves than ſternutatories, by their ſubtile, acrid, and volatile ſalt gently ſtimulating the pituitary membrane, and drawing the mucid humour from it. They are alſo much ſafer than ſternutatories in their effects.

Errhines prepared of cephalic herbs are of ſingular ſervice in oppreſſive pains of the head, a hermicrania, lethargic diſorders, weakneſſes of memory, ſtuffings of the head, and coryza, mucous defluxions of the eyes, drowſineſs, vertigoes, and in caſes where the malignant humours generated by the lues venerea are lodged in the membranes of the noſtrils.

ERROR, in philoſophy, a miſtake of our judgment, giving aſſent to that which is not true.

Mr Locke reduces the cauſes of error to theſe four; firſt, want of proofs; ſecondly, want of ability to uſe them; thirdly, want of will to uſe them; and, fourthly, wrong meaſures of probability.

He obſerves upon the firſt of theſe cauſes of error, that the greateſt part of mankind want conveniences and opportunities of making experiments and obſervations themſelves, or of collecting the teſtimony of others, being prevented by the neceſſity of their condition. Upon the ſecond of theſe cauſes, he obſerves, that there are many, who, from the ſtate of their condition, might beſtow time in collecting proofs, but yet are not able to carry a train of conſequences in their heads, nor weigh exactly the preponderancy of contrary proofs and teſtimonies, merely from the difference in mens underſtandings, apprehenſions, and reaſonings. Thirdly, he remarks, that though ſome have opportunities and leiſure enough, and want neither parts, learning, nor other helps, that they never come to the knowledge of ſeveral truths within their reach, either upon account of their attachment to pleaſure or buſineſs; or otherwiſe becauſe of their lazineſs or averſion to ſtudy. The fourth cauſe of error, *viz.* wrong meaſures of probability, he imputes, 1. To the practice of taking for principles propoſitions that are not in themſelves certain and evident, but, on the contrary, doubtful and falſe. 2. To received hypotheſes 3. To predominant paſſions or inclinations. And, 4 To authority, or the giving up our aſſent to the common received opinions either of our friends or party, neighbours or country.

The cauſes of error in philoſophy, or the reaſons why all former philoſophers have through ſo many ages erred, according to Lord Bacon, are theſe following. 1. Want of time ſuited to learning. 2. The little labour beſtowed upon natural philoſophy. 3. Few entirely addicted to natural philoſophy. 4. The end of the ſciences wrong fixed. 5. A wrong way choſen. 6. The neglect of experiments. 7. Regard to antiquity and authority. 8. Admiration of the works in uſe. 9. The artifice of teachers and writers in the ſciences. 10. Oſtentatious promiſes of the moderns. 11. Want of propoſing worthy taſks. 12. Superſtition and zeal being oppoſite to natural philoſophy, as thinking philoſophy dangerous, on account of the ſchool theology; from the opinion that deep natural inquiries ſhould ſubvert religion. 13. Schools and academies proving unfavourable to philoſophy. 14. Want of rewards. And, 15. Deſpair, and the ſuppoſition of impoſſibility.

*ERROR Loci.* Boerhaave is ſaid to have introduced the term, from the opinion that the veſſels were of dif-

different ſizes for the circulation of blood, ſerum, and lymph; and that when the larger-ſized globules were forced into the leſſer veſſels by an error of place, they were obſtructed. But this opinion does not ſeem well grounded.

ERUCA, in general, denotes caterpillars of all kinds.

The caterpillar ſtate is that through which every butterfly muſt paſs before it arrives at its perfection and beauty: and, in the ſame manner, all the known winged animals, except only the puceron, paſs through a reptile ſtate; none of them, except this, being produced in their winged form. The change from caterpillar to butterfly was long eſteemed a ſort of metamorphoſis; a real change of one animal into another: but this is by no means the caſe. The egg of a butterfly produces a butterfly, with all lineaments of its parent; only theſe are not diſcloſed at firſt, but for the greater part of the animal's life they are covered with a ſort of caſe or muſcular coat, in which are legs for walking, which only ſuit it in this ſtate; but its mouth takes in nouriſhment, which is conveyed to the included animal; and after a proper time this covering is thrown off, and the butterfly, which all the while might be diſcovered in it by an accurate obſerver with the help of a microſcope, appears in its proper form. Before it paſſes into this ſtate, however, there requires a ſtate of reſt for the wings to harden, and the ſeveral other parts to acquire their proper firmneſs; this is tranſacted in a time of perfect reſt, when the animal lies in what is called the *nymph* or *chryſalis* ſtate, in appearance only a lump of inanimate matter. There is a ſettled and determined time for each of theſe changes in every ſpecies; but, in the ſeveral different kinds, the periods are very different.

There is no ſign of ſex in the animal while in the caterpillar ſtate: the propagation of the ſpecies is the buſineſs of the creature in its ultimate perfection; and till that, theſe parts are never excluded: one female butterfly, when ſhe has been impregnated by the male, will produce 300 or 400 eggs, or even more.

There is no way of knowing the ſexes of theſe little creatures by viewing the parts; but the whole figure and manner of the animal makes the difference. The females are always larger than the males; they are alſo more ſlow in their motions; and ſome of them have no wings, or, at the moſt, only very ſmall ones. The males, however, have a ſort of beards, more beautiful than the antennæ or horns of the females: the female is much ſtronger as well as bigger than the male; and not unfrequently, in caſe of danger or diſturbance, ſhe flies away with him in time of copulation.

On diſſecting the female, her uterus affords an aſtoniſhing ſight. The number of eggs in the tubes is amazing: but theſe have not all the ſame figure; and, in ſome ſpecies, as the ſilk-worm, &c. the eggs are of a beautiful blue; if any yellowiſh ones are ſeen among them, they are judged to be defective.

The care of all the butterfly tribe to lodge their eggs in ſafety is ſurpriſing. Thoſe whoſe eggs are to be hatched in a few weeks, and who are to live in the caterpillar ſtate during part of the remaining ſummer, always lay them on the leaves of ſuch plants as will afford a proper nouriſhment; but, on the contrary, thoſe whoſe eggs are to remain unhatched till the following ſpring, always lay them on the branches of trees and ſhrubs, and uſually are careful to ſelect ſuch places as are leaſt expoſed to the rigour of the enſuing ſeaſon, and frequently cover them from it in an artful manner. Some make a general coat of a hairy matter over them, taking the hairs from their own bodies for that purpoſe; others hide themſelves in hollow places in trees, and in other ſheltered cells, and there live in a kind of torpid ſtate during the whole winter, that they may depoſit their eggs in the ſucceeding ſpring, at a time when there will be no ſeverities of weather for them to combat. The day-butterflies only do this, and of theſe but a very few ſpecies; but the night ones, or phalenæ, all without exception, lay their eggs as ſoon as they have been in copulation with the male, and die immediately afterwards.

It is well known, that the common and natural food of theſe creatures is the leaves and verdure of vegetables; yet, as weak and harmleſs as they ſeem, they will many of them deſtroy their fellows whenever they get an opportunity. M. Reamur gives us an inſtance of this in 20 caterpillars of the oak, which he kept in a box with a ſufficient quantity of their natural food: yet their numbers daily decreaſed, till at laſt there remained only one. This is, however, only the caſe in ſome few ſpecies, the generality of theſe animals being very peaceable, many ſpecies living together in the ſame place without moleſting one another. Theſe ſpecies, however, though freed from ſuch dangers, are expoſed to others of a much more terrible kind; the worms or maggots of ſeveral ſorts of flies are frequently found about them, ſome preying upon their outſide, others lodged within them under the ſkin, but both kinds eating the poor defenceleſs creature up alive. Thoſe which feed on the outſides are eaſily diſcovered, the others are more hid; and frequently the caterpillar, which ſeems very hearty and vigorous, and very fleſhy, ſhall be found, upon opening, to be a mere ſkin, the internal parts being found to be all eaten away, and all the food that he ſwallows ſerving only to feed a vaſt number of worms, or maggots, which crawl about at liberty within him. Theſe devouring worms are of many different ſpecies; ſome being of the gregarious, ſome of the ſolitary kinds, and ſome ſpinning webs of their own ſilk to transform themſelves in; others undergoing that change without any ſuch covering. The beautiful cabbage-caterpillar is one of thoſe unhappy kinds which frequently are infeſted with the gregarious kinds, large numbers of which ſpin themſelves webs one after another, and afterwards come out in the ſhape of the parent-fly to whoſe eggs they owed their origin.

Theſe inteſtine enemies are a ſure prevention of the butterfly's appearing at its proper time; and as many of the former naturaliſts, who knew what butterfly to expect from a peculiar ſpecies of caterpillar which they preſerved, often ſaw a parcel of flies come out in the place of it, they having no idea that the fly had laid its eggs in the fleſh of the poor creature, ſuppoſed that this was one of its natural transformations, and that certain ſpecies of caterpillars ſometimes produced butterflies, ſometimes ſmall flies.

Theſe, and many other deſtroyers, among which the birds are to be reckoned in the principal place, ſerve a noble purpoſe in preventing the too great number of theſe miſchievous animals. Their uſual habitation

tion being the leaves and flowers of plants, they are, in their feeding, much expoſed to all thoſe deſtroyers: yet nature has taken care to preſerve a great number, by making many of them ſo exactly of the colour of the leaves they feed on, that they are not eaſily diſtinguiſhed from them; and by giving others a caution of keeping on the under part of the leaves, and being by that means out of ſight. But ſome ſpecies are much leſs expoſed, and of much more miſchief to the plants they feed on, by devouring more eſſential parts of them. Of theſe ſome eat the roots, and others the interior part of the trunk, deſtroying the veſſels that imbibe, and thoſe that diſtribute the juices. Theſe are different from the common caterpillars, in that their ſkin is much leſs rough and hard; and theſe are ſecure from our obſervation, and in general from their great deſtroyers the birds. They are not, however, abſolutely ſafe from the common dangers of the other ſpecies; for there is a kind of worms that find their food and habitation even in the bodies of theſe.

The root-caterpillars, and thoſe which live within the branches of plants, are much more eaſily found out. The roots of ſcrophularia, and the ſtalks of lettuces, and ſome other plants, afford caterpillars which ſeem all of the ſame ſpecies. Thoſe found in the lettuces are extremely plentiful ſome years, and deſtroy vaſt quantities of that plant. Theſe uſually have their firſt habitation in the ſtalk, near the root.

Nothing more ſurpriſes us, in regard to inſects, than their induſtry; and in this the caterpillars yield to no kind, not to mention their ſilk, the ſpinning of which is one great proof of it. The ſheaths and caſes which ſome of theſe inſects build for the paſſing their transformations under, are, by ſome, made of the ſilk, with their own hair, mixed with pieces of bark, leaves, and other parts of trees, with paper, and other materials; and the ſtructure of theſe is well worthy our attention.

There are others whoſe workmanſhip, in this article, far exceeds theſe. There is one which builds in wood, and is able to give its caſe a hardneſs greater than that of the wood itſelf in its natural ſtate. This is the ſtrange horned caterpillar of the willow, which is one of thoſe that eat their *exuviæ*. This creature has extremely ſharp teeth, and with theſe it cuts the wood into a number of ſmall fragments: theſe fragments it afterwards unites together into a caſe, of what ſhape it pleaſes, by means of a peculiar ſilk; which is no other than a tough and viſcous juice, which hardens as it dries, and is a ſtrong and firm cement. The ſolidity of the caſe being thus provided for, we are to conſider, that the caterpillar incloſed in it is to become a butterfly; and the wonder is, in what manner a creature of this helpleſs kind, which has neither legs to dig nor teeth to gnaw with, is to make its way out of ſo firm and ſtrong a lodgment as this is in which it is hatched. It has been ſuppoſed by ſome, that the butterfly, as ſoon as hatched, diſcharged a liquor which ſoftened the viſcous matter that holds the caſe together, and ſo its ſeveral fragments falling to pieces, the way out lies open. This is evidently the truth of the caſe; though thoſe who ſuppoſed it, did it by mere conjecture: for, on a ſtrict examination, this liquor is always to be found in the animal, and is of the moſt proper kind for ſuch a ſervice. Reaumur judged, from the effects, that this liquor muſt be of a ſingular nature, and very different from the generality of animal fluids: and in diſſecting this creature in the caterpillar ſtate, there will always be found near the mouth, and under the œſophagus, a bladder of the bigneſs of a ſmall pea, full of a limpid liquor, of a very quick and penetrating ſmell, and which, upon divers trials, proves to be a very powerful acid; and among other properties, which it has in common with other acids, it ſenſibly ſoftens the glue of the caſe, on a common application.

It is evident that this liquor, beſides its uſe to the caterpillar, remains with it in the chryſalis ſtate, and is the very thing that gives it a power of diſſolving the ſtructure of the caſe, and making its way through in a proper manner at the neceſſary time. Dr Boerhaave has adopted the opinion, that there are no true acids in animals, except in the ſtomach or inteſtines; but this familiar inſtance proves the error of that determination. Phil. Tranſ. abr. ix. p. 39, &c.

Another very curious and myſterious artifice, is that by which ſome ſpecies of caterpillars, when the time of their changing into the chryſalis ſtate is coming on, make themſelves lodgments in the leaves of the trees, by rolling them up in ſuch a manner as to make themſelves a ſort of hollow cylindric caſe, proportioned to the thickneſs of their body, well defended againſt the injuries of the air, and carefully ſecured for their ſtate of tranquillity.

Beſides theſe caterpillars, which in this manner roll up the leaves of plants, there are other ſpecies which only bend them once; and others which, by means of thin threads, connect many leaves together to make them a caſe. All this is a very ſurpriſing work, but all much inferior to this method of rolling.

The different ſpecies of caterpillars have different inclinations, not only in their ſpinning and their choice of food, but even in their manners and behaviour one to another. Some never part company from the time of their being hatched to their laſt change; but live and feed together, and undergo together their laſt change into the chryſalis ſtate. Others ſeparate one from another as ſoon as able to crawl about, and each hunts its fortune ſingle; and there are others which regularly live to a certain time of their lives in community, and then ſeparate each to ſhift for itſelf, and never to meet again in that ſtate. *Reamur, Hiſt. Inſect.* vol. ii. *paſſim.*

Caterpillars are very deſtructive and pernicious in gardens, particularly thoſe of two ſpecies. The one of theſe is that which afterwards becomes the common white butterfly. This is of a yellowiſh colour, ſpotted with black; and infeſts the leaves of cabbages, cauliflowers, and the Indian creſs, of which it eats off all the tender parts, leaving only the fibres entire; ſo that whole plantations are often ſeen deſtroyed by them in autumn, eſpecially ſuch as are near large buildings, or are crowded with trees. There is no remedy againſt this evil but the pulling the creatures off before they are ſpread from their neſts, and watching the butterflies, which are daily, in the hot weather, depoſiting their eggs on theſe plants. Theſe, however, feed principally on the outſide of the leaves of the plants, and are therefore the eaſier taken off; but the other kind lies near the centre, and therefore is with much more difficulty diſcovered. This is much larger; and the ſkin is very tough, and of a brown colour. It is called by the gardeners a *grub*, and is extremely pernicious. The eggs which produce it are uſually depoſited in the very heart or centre of the plant, particularly in cabbages; and the creature, when formed, and grown to ſome ſize, eats its way through all the blades, and leaves its dung in great quantity behind it, which ſpoils the cabbage. This inſect alſo burrows under the ſurface of the ground, and makes ſad havock among young plants, by eating off their tender ſhanks, and drawing them into its holes. This miſchief is chiefly done in the night; but wherever a plant is ſeen thus deſtroyed, if the earth be ſtirred with a finger an inch deep, the creature will be certainly found, and this is the only way of deſtroying them. *Miller*.

When theſe animals attack fruit-trees, the beſt method of driving them off is to boil together a quantity of rue, wormwood, and the common tobacco, of each equal parts, in common water; to make the liquor very ſtrong, and ſprinkle it on the leaves and young branches every night and morning, during the time when the fruit is ripening. See alſo the article CATERPILLAR.

In Dr Hawkeſworth's Account of the Voyages to the South Sea. vol. iii. p. 520. we have the following account of a kind of ſmall green caterpillar, which the voyagers found in great numbers on the true Weſt Indian mangroves. Their bodies were thick ſet with hairs, and they were ranging on the leaves ſide by ſide like files of ſoldiers, to the number of 20 or 30 together. When they touched them, they found that the hairs on their bodies had the quality of a nettle, and gave them a much more acute though leſs durable pain.

*ERUCÆ Aquaticæ, Water Caterpillars.* It may ſeem incredible, that there is any ſuch thing as a caterpillar whoſe habitation is under water; but experience and obſervation prove, that there are ſuch, and that they feed on the water-plants as regularly as the common kinds do on thoſe at land. Theſe are not named at random like many of the aquatic animals of the larger kinds, as the ſea-wolf, the ſea-horſe, &c. which might as well be called any thing elſe as *wolves* and *horſes*; but they are properly what they are called, and do not reſpire in the manner of the fiſh-tribe, but by their ſtigmata as other caterpillars. M. Reaumur, in his obſervations, met with two ſpecies of theſe; the one upon the potamogiton or pond-weed, the other upon the lenticula or duck-meat. Theſe are both very induſtrious animals; but the firſt being much the largeſt, its operations are more eaſily diſtinguiſhed.

This, though truly an aquatic animal, ſwims but badly, and does not at all love to wet itſelf. The parent butterfly lays her egg on the leaf of a certain plant; and as ſoon as the young caterpillar is hatched, it gnaws out a piece of the leaf, of a roundiſh ſhape. This it carries to another part of the ſame leaf, and lays it in ſuch a manner, that there may be a hollow between, in which it may lodge. It then faſtens down this piece to the larger leaf with ſilk of its own ſpinning; only leaving certain holes at which it can put out its head, and get to gnaw any of the leaves that are near. It eaſily gets out, though the aperture be naturally ſmall, ſince a little force from its body bends up the upper leaf and down the lower, both being flexile; and when the creature is out, it has a ſort of down that defends it from being wetted, and the natural elaſticity of the leaves and of the ſilk joins the aperture up again, ſo that no water can get in. The leaves of this kind of plant are alſo naturally very ſlippery, and not eaſily wetted by water. It ſoon happens that this habitation becomes too ſmall for the animal, in which caſe it makes juſt ſuch another; and after that, at times, ſeveral others; each being only made fit for it at the ſize it is then of. The changes of this creature into the chryſalis and butterfly ſtates are in the common method. The butterfly gets out of a chryſalis which was placed on the ſurface of the water; the lightneſs of the animal eaſily ſuſtains it on the water till its wings are dried, and then it leaves that element, never to return to it again.

*ERUCÆ Sylveſtris, Wood-caterpillars*; the name of a ſort of caterpillars which do not live, after the manner of others, on leaves of trees or plants, or open to our obſervation; but under the bark, in the trunk and branches, and in the roots of trees, and ſometimes in the body of fruits.

Theſe are eaſily diſtinguiſhed from thoſe worms and maggots which are found in roots and fruits, and owe their origin to flies of another kind; but are liable to be confounded with a ſort of animals, called by M. Reaumur, *falſe* or *baſtard caterpillars*, which carry a great reſemblance in their figure to real caterpillars, but which have more legs than any of the true ones have, and are finally transformed into four-winged flies, which are not true butterflies.

The butterflies which are the parents of thoſe caterpillars that lie immured in trees or fruits, lay their eggs on the ſurface; and the young caterpillars, when hatched, eat their way in. What appears ſomething ſurpriſing, however, in this, is, that there uſually is only one caterpillar in a fruit which is large enough to afford food to a great number; and if there are ſometimes found two creatures within, one is uſually a caterpillar, the other a worm of ſome other kind. The whole occaſion of which is, that the operation of penetrating into the fruit is ſo difficult to the young animal, that it ſeldom ſucceeds in it; and tho' the butterfly depoſits many eggs on each fruit, and theſe all hatch, yet it is only here and there one on a fruit that can find the way into it.

Theſe creatures, when once lodged in their priſon, have nothing to do but to eat up the ſubſtances which incloſe them, leaving the outer hard ſhell unhurt, which ſtill ſerves as a caſe for them. This is a very frequent caſe in the grains of corns, where the farinaceous ſubſtance ſerves as aliment, and the hard outer ſkin becomes a firm hollow caſe afterwards for the animal. The farinaceous ſubſtance in this caſe uſually proves enough for the animal in its caterpillar ſtate; but if it does not, the creature has recourſe to a very ſingular expedient: it eats again its own excrements; and finds its now ſtronger ſtomach able to ſeparate nouriſhment from that very matter which had before paſſed off from its weaker ſtomach undigeſted.

Of theſe ſpecies of caterpillars, ſome go out of their priſon in order to change into their chryſalis, and thence into their butter-fly ſtate; but the greater number

ber remain there, and paſs through all their changes within. Theſe caterpillars, like all the other kinds, have certain fleſh-eating worms, whoſe parents are of the fly-kind, for their terrible enemies and deſtroyers; and it is not unfrequent, on opening one of theſe ſpoiled fruits, inſtead of the expected caterpillar, to find a fly juſt ready to come out: this has been produced from the chryſalis of a worm, which had before found its way into the fruit, and eat up the caterpillar, which was the original poſſeſſor of the place.

ERUDITION, denotes learning or knowledge; and chiefly that of hiſtory and antiquity, of languages and of books, which is the reſult of hard ſtudy and extenſive reading. The Scaligers were men of deep erudition: the writings of M. Launoy, a prieſt of the Oratory, are full of erudition.

Mr Locke ſays, it is of more uſe to fill the head with reflections than with points of erudition. If the mind be not juſt and right, ignorance is better than erudition, which only produces confuſion and obſcurity. M. Balzac calls a heap of ill choſen erudition the luggage of antiquity.

ERUPTION, in medicine, a ſudden and copious excretion of humours, as pus or blood: it ſignifies alſo the ſame with exanthema, any breaking out, as the puſtules of the plague, ſmall-pox, meaſles, &c.

ERUPTION *of Volcanoes*. See ÆTNA, ETNA, VESUVIUS, VOLCANO, &c.

ERVUM, the LENTIL: A genus of the decandria order, belonging to the diadelphia claſs of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The calyx is quinquepartite, the length of the corolla. There are ſix ſpecies; of which the moſt remarkable is the lens, or common lentil. It is cultivated in many parts of England, either as fodder for cattle, or for the ſeeds which are frequently uſed in meagre ſoups. It is an annual plant, and riſes with weak ſtalks about 18 inches high, garniſhed with winged leaves compoſed of ſeveral pairs of narrow lobes, terminated by a claſper or tendril, which faſtens to any neighbouring plant, and is thereby ſupported: the flowers come out three or four together, upon ſhort footſtalks from the ſide of the branches. They are ſmall, of a pale purple colour, and are ſucceeded by ſhort flat pods, containing two or three ſeeds which are flat, round, and a little convex in the middle. The ſeeds of this plant are moſt commonly ſown in the month of March, where the land is dry; but in moiſt ground, the beſt time is April. The uſual quantity of ſeed allowed for an acre of land is from one buſhel and a half to two buſhels. If theſe are ſown in drills in the ſame manner as peaſe, they will ſucceed better than when ſown in broadcaſt: the drills ſhould be a foot and a half aſunder, to allow room for the Dutch hoe to clean the ground between them; for if the weeds are permitted to grow among them, they will get above the lentils and ſtarve them.

There is another ſort of lentil alſo cultivated in this country under the name of *French lentil*. It is twice the ſize of the former, both in plant and ſeed; and is much better worth cultivation than the other. It ſhould be ſown in March, after a ſingle ploughing, in the ground that bore corn the year before. Manure is not abſolutely neceſſary, though it will undoubtedly increaſe the crop. Its graſs is ſaid to be very copious; it may be mowed many times in the year, and affords a healthy as well as an agreeable food to horſes, cows, and ſheep: the milk of cows fed with it is ſaid to be very copious and good. Long and numerous pods ripen about the beginning of winter, which afford a new kind of legumen, to be eaten as common lentils: when freſh, it makes admirable peaſe-ſoup; dry, it is greedily eaten by the poultry. The dried herb is alſo a good reſource for cattle in winter. It grows on any kind of ground.

ERYMANTHUS, a mountain, river, and town of Arcadia, where Hercules killed a prodigious boar, which he carried on his ſhoulders to Euryſtheus; who was ſo terrified at the ſight, that he hid himſelf in a brazen veſſel.

ERYNGIUM, SEA-HOLLY, or *Eryngo:* A genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The flowers are collected into a round head, and the receptacle is paleaceous. There are nine ſpecies; moſt of which are hardy herbaceous perennials, producing erect ſtalks from one to two or three feet high; with ſimple, entire, or divided prickly leaves; and the ſtalks terminated by roundiſh aggregate heads of quinquepetalous flowers, of white, blue, or purple colours. They all flower moſtly in July, and the ſeeds ripen in September. They are propagated by ſeeds ſown in a bed or border, either in ſpring or autumn. The plants are to be removed the autumn after they come up, into thoſe places where they are deſigned to remain. The leaves of one of the ſpecies (viz. the maritimum, which grows naturally on the ſea-coaſts of England and Scotland) are ſweetiſh, with a light aromatic warmth and pungency. The roots are accounted aphrodiſiac, and are ordered to be kept candied in the ſhops. The young flowering ſhoots eaten like aſparagus are very grateful and nouriſhing.

ERYSIMUM, HEDGE-MUSTARD: A genus of the ſiliquoſa order, belonging to the tetradynamia claſs of plants; and in the natural method ranking under the 39th order, *Siliquoſæ*. The ſiliqua is long, linear, and exactly tetragonal; the calyx cloſe. There are ſix ſpecies; of which the moſt remarkable is the officinale, hedge-muſtard, or bank-creſſes. It grows naturally in Britain under walls, by the ſides of highways, and among rubbiſh. It is warm and acrid to the taſte; and when cultivated, is uſed as a vernal pot-herb. Birds are fond of the ſeeds; ſheep and goats eat the herb; cows, horſes, and ſwine refuſe it. The ſeeds are ſaid to promote expectoration, excite urine and the other fluid ſecretions, and to attenuate and diſſolve viſcid juices, &c. This they are ſuppoſed to perform by an acrimonious ſtimulating quality; but the taſte diſcovers in them only an herbaceous ſoftneſs void of acrimony: the ſeeds indeed are conſiderably pungent, and the roots in ſome ſmall degree.

ERYSIPELAS, in medicine, an eruption of a fiery or acrid humour, from which no part of the body is exempted, though it chiefly attacks the face. See MEDICINE-*Index*.

ERYTHEA, or ERYTHIA, an iſland adjoining, according to the ancients, either to or a part of Gades; no where now to be found by the deſcription given of it by ancient authors. The poets feign this to be the habitation of the fabulous Geryon, diſarmed by Hercules, who drove away his cattle.

ERYTHRÆ (anc. geog.), a port town of Ætolia, on the Corinthian bay. Another Erythræ of Bœotia, near Platæa and mount Cithæron. A third Erythræ, a town of Ionia in the Hither Aſia, ſituated in the peninſula, at its extremity, with a cognominal port. The Erythræans laid claim to the Sibyl Herophile, as their country-woman, ſurnamed thence *Erythræa*. Erythræ was famous for an ancient temple of Hercules.

ERYTHRÆA, a town of Crete, ſituated in the ſouth-eaſt of the iſland, at the promontory Erythræum.

ERYTHRÆUM MARE, erroneouſly called *Rubrum* by the Romans. Thus the ocean that waſhes Arabia and Perſia, and extends a great way farther, is denominated. Hence it is, Herodotus ſays, that the Euphrates and Tigris fall into the Mare Erythræum. He alſo calls it the *South Sea*, on which the Perſians dwell. It takes its name, not from its colour, the error of the Romans, who tranſlated *Erythræum*, "Rubrum;" but from *Erythras*, ſon of Perſeus and Andromeda, whoſe kingdom lay on the confines of that ſea; whence its name *Erythræum*.

ERYTHRINA, CORAL-TREE: A genus of the decandria order, belonging to the diadelphia claſs of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The calyx is bilabiate, the one lip above, the other below; the vexillum of the corolla is very long and lanceolated. There are four ſpecies, all of them ſhrubby flowering exotics for the ſtove, adorned chiefly with trifoliate or three-lobed leaves, and ſcarlet ſpikes of papilionaceous flowers. They are all natives of the warm parts of Africa and America; and muſt always be kept in pots, which are to remain conſtantly in ſtoves in this country. They are propagated by ſeeds, which are annually imported hither from Africa and America. They are to be ſown half an inch deep in pots of light rich earth, which are then to be plunged in the bark-bed of the ſtove; and when the plants are two inches high, they are to be ſeparated into ſmall pots, plunging them alſo in the bark-bed, giving them frequent waterings, and as they increaſe in growth ſhifting them into larger pots. The inhabitants of Malabar make ſheaths of the wood, for ſwords and knives. They uſe the ſame, together with the bark, in waſhing a ſort of garments which they call ſaraſſas; and make of the flowers the confection caryl. The leaves pulveriſed and boiled with the mature cocoa-nut, conſume venereal buboes, and eaſe pains in the bones; bruiſed and applied to the temples, they cure the cephalea and ulcers: mixed with the ſugar called *jagra*, they mitigate pains in the belly, eſpecially in women; and the ſame effect follows from the uſe of the bark levigated with vinegar, or ſwallowing the kernel ſtripped of its red pellicle. The juice of the leaves taken with oil mitigates venereal pains; drank with an infuſion of rice, it ſtops fluxes; made into a cataplaſm with the leaves of betel, it deſtroys worms in old ulcers; and worked with oil, it cures the pſora and itch.

ERYTHRINUS, in ichthyology, a ſpecies of SPARUS.

ERYTHROIDES, in anatomy, the firſt of the proper tunics or coats which cover the teſticles.

ERYTHRONIUM, DOG'S-TOOTH VIOLET: A genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 11th order, *Sarmentaceæ*. The corolla is hexapetalous and campanulated; with a nectarium of two tubercles adhering to the inner baſe of every other petal. There is only one ſpecies, which, however, admits of ſeveral varieties in its flowers, as white, purple, pale red, dark red, crimſon, and yellow. The plants are low and herbaceous, with a purple ſtalk and hexapetalous flowers. All the varieties are hardy and durable; and may be planted in ſmall patches in borders, where they will make a good appearance. They rarely perfect their ſeeds in this country, but may be propagated by offſets. In Siberia, according to Gmelin, they dry and mix the root of this plant with their ſoups. It grows there in great abundance; and is called by the people of the country *beſs*.

ERYTHROXYLON, in botany: A genus of the trigynia order, belonging to the decandria claſs of plants; and in the natural method ranking with thoſe the order of which is doubtful. The calyx is turbinated; the petals of the corolla have each a nectariferous emarginated ſcale at the baſe; the ſtamina are connected at the baſe; the fruit a bilocular plum.

ERYX, a ſon of Butes and Venus, who relying upon his ſtrength, challanged all ſtrangers to fight with him in the combat of the ceſtus. Hercules accepted his challenge after many had yielded to his ſuperior dexterity; and Eryx was killed in the combat, and buried on the mountain, where he had built a temple to Venus. Virg. Æn. 5. v. 402. A mountain of Sicily near Drepanum, which received its name from Eryx, who was buried there. This mountain was ſo ſteep, that the houſes which were built upon it ſeemed every moment ready to fall. Dædalus had enlarged the top, and incloſed it with a ſtrong wall. He alſo conſecrated there to Venus Erycina a golden heifer, which reſembled life ſo much, that it ſeemed to exceed the power of art.

ERZERUM, or ERZERON, a city of Turky in Aſia, and capital of Armenia, or Turkomania. It is a pretty large town, five days journey from the Black Sea, and ten from the frontiers of Perſia. It ſtands in a delightful plain, at the foot of a chain of mountains, which hinder the Frat, or Euphrates, from falling into the Black Sea. A neighbouring hill ſupplies very fine ſprings, which not only water the fields, but the ſtreets of the town. Erzerum is ſurrounded with double walls, defended by pentagonal towers; but the ditches are neither deep nor well kept up. The beglerbeg, or baſhaw of the province, lives in the ſeraglio, which is very ill built. They reckon that there are 18,000 Turks at Erzerum, 6000 Armenians, and 10,000 Greeks. The Armenians have a biſhop and two churches; and the Greeks have alſo a biſhop, but the church is a miſerable place. The laſt are moſtly braziers, inhabiting the ſuburbs, who work the copper brought from the neighbouring mountains. They drive a great trade in copper utenſils and furs, particularly martins ſkins. Five or ſix days journey from the town there are oaks that produce plenty of gall-nuts, which are brought hither. This place is the thoroughfare and reſting place of all the merchants trading to the Indies, eſpecially when the Arabs are watching for their prey round Aleppo and Bagdad. E Long. 40. 50. N. Lat. 29. 46.

ESARHADDON, the ſon of Sennacherib, and his ſucceſſor in the kingdom of Aſſyria. He is ſaid to have reigned 29 years at Nineveh, from the year 3294 to 3322; beſides which he reigned 13 years at Babylon, in all 42 years. He died in the year of the world 3336, and was ſucceeded by Saoſduchinus. Eſarhaddon, in the opinion of Sir Iſaac Newton, ſeems to be the Sardanapalus who died, as Clectarchus ſays, of old age, after the revolt of Syria; the name *Sardanapalus* being derived from *Aſſerhadon Pul.*

ESCALADE, or Scalade, a furious attack of a wall or a rampart; carried on with laders, to paſs the ditch or mount the rampart; without proceeding in form, breaking ground, or carrying on regular works to ſecure the men.

When the troops are prepared to paſs the ditch, either with the aſſiſtance of boards, hurdles, and faſcines, when it is muddy, or with ſmall boats of tin, or baſkets covered with ſkins or oil-cloth, when it is deep and filled with water, a party muſt be placed on the counterſcarp, oppoſite to the landing-place, ready to fire at the garriſon if they are alarmed, and oppoſe the mounting on the rampart. If the ditch is dry, the ladders are fixed in ſome place fartheſt diſtant from the centry; and as ſoon as they get upon the rampart, they put themſelves in order to receive the enemy; if the centry ſhould be ſurpriſed and ſilently overcome, the detachment haſtens to break open the gate, and to let in the reſt of the party. If the ditch is wet, the rampart high, and provided with a revetement, it will be difficult to ſurpriſe the town in this way; but if there is no revetement, the troops may hide themſelves along the outſide of the rampart till all are over. Since the invention and uſe of gunpowder, and the walls of cities have been flanked, they are ſeldom taken by eſcalade.

ESCALLONIA, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants. The fruit is bilocular and polyſpermous; the petals diſtant and tongue-ſhaped; the ſtigma headed.

ESCAPE, in law; a violent or privy evaſion out of ſome lawful reſtraint, without being delivered by due courſe of law. There are two ſorts of eſcapes, voluntary and negligent. Voluntary, when a man arreſts another for felony, or other crime, and afterwards lets him go freely by conſent; in which caſe, the party that permits ſuch eſcape is held guilty, committed, and muſt anſwer for it. Negligent eſcape, on the contrary, is where one is arreſted, and afterwards eſcapes againſt the will of the perſon that arreſted him, and is not purſued with freſh ſuit, and retaken before the perſon purſuing hath loſt ſight of him. By ſtat. 8 and 9 Will. III. c. 26. the keepers of priſons conniving at eſcapes ſhall forfeit 500l; and in civil caſes the ſheriff is anſwerable for the debt.

ESCHALOT, or Shallot. See Allium.

ESCHAR, in ſurgery, the cruſt or ſcab occaſioned by burns or cauſtic medicines.

ESCHARA, in natural hiſtory, the name of a ſpecies of coralline, &c. the characters of which are theſe: they are of a ſtony or coral-like hardneſs, and reſemble a woven cloth in their texture; and the microſcope informs us, that they conſiſt of arrangements of very ſmall cells, whoſe ſurfaces appear much in that form. Linnæus makes it a ſpecies of millepora, in the claſs of lithophytes. See Plate CXLVIII. fig. 9. 10.

The narrow-leaved hornwrack, fig. 9. divides as it riſes, into narrow leaves made up of regular rows of oblong ſquare-ſhaped cells placed alternately by each other, and oppoſite to an equal number on the other ſide of the leaf, like an honeycomb: from theſe leaves proceed other ſtill ſmaller foliaceous ramifications, many of which ſeem to be connected at the lower part by tubuli, as in the corallines; by which means they can ply to and fro more freely in the water.—*e*, Gives the natural appearance of this coralline. E repreſents two leaves with their tubuli and cells magnified. E 1 is a croſs ſection of one of the leaves at E, ſhowing the partition and inner form of their cells.

The broad-leaved hornwrack, fig. 10. when freſh taken out of the ſea, is of a ſpongy ſoft texture, and ſmells very fiſhy; but when it has lain for ſome time on the ſhore, it becomes ſtiff and horny, like ſome ſort of withered leaves. Both ſurfaces, when examined by glaſſes, appear to be covered with cells; and, when a piece of it is cut acroſs, one may diſcover the thin membrane that ſerves as a baſe to the cells of each ſurface. The form of the cells is very remarkable, each one being arched at the top, and contracted a little at the lower part of the ſides to make way for the arches of the two next adjoining cells; ſo that by this particular conſtruction no room is loſt. The entrance of the cells is immediately under the arch of each cell, and the walls of the cells ſeem to be fortified with ſpines. Juſſieu diſcovered ſmall polypes extending themſelves out of theſe cells, which he has deſcribed in the memoirs of the Academy of Sciences 1742.—*f*, Gives the natural appearance of a leafy branch of this coralline. F is a part of a leaf magnified to ſhow the ſuperficial figure of the cells, and the manner in which they are diſpoſed. F 1 ſhows a croſs ſection of a leaf, and diſcovers the ſeveral partitions of the cells.

At the entrance of many of the cells a ſmall teſtaceous body like a bivalve ſhell is diſcovered: F 2, the figure of the cell, with the ſhell in it; it is of a tranſparent amber colour, ſo clear that one may ſee the dead animal through it, repreſented by the black ſpot.

ESCHEAT, in law, ſignifies any lands or tenements that caſually fall to a lord within his manor. It is one of the conſequences of tenure in chivalry: (See *Feodal Syſtem*, *Knight-Service*, and Tenure). It is the determination of the tenure or diſſolution of the mutual bond between the lord and tenant, from the extinction of the blood of the latter by either natural or civil means: if he died without heirs of his blood, or if his blood was corrupted and ſtained by commiſſion of treaſon or felony; whereby every inheritable quality was entirely blotted out and aboliſhed. In ſuch caſes the land eſcheated or fell back to the lord of the fee; that is, the tenure was determined by breach of the original condition, expreſſed or implied in the feodal donation. In the one caſe, there were no heirs ſubſiſting of the blood of the firſt feudatory or purchaſer, to which heirs alone the grant of the feud extended: in the other, the tenant, by perpetrating an atrocious crime, ſhowed that he was no longer to be truſted as a vaſſal, having forgotten his duty as a ſubject; and therefore forfeited his feud, which he held under the implied condition that he ſhould not be a traitor or a felon. The conſequence of which in both caſes was, that the gift being determined, reſulted back to the lord who gave it.

The word *eſcheat* is ſometimes uſed for the place or circuit within which the king or other lord is intitled to eſcheats; alſo for a writ to recover the ſame from the perſon in poſſeſſion after the tenant's death.

Escheat, in Scots law, is that forfeiture which is incurred upon a perſon's being denounced a rebel. See Law, Part III. N° clxvi. 12.

ESCHEVIN, or Echevin *(Scabinus)*, in the French and Dutch polity, a magiſtrate elected by the inhabitants of a city, to take care of their common concerns, the good order, conveniency, and decoration of the city, &c.

At Paris there is a prevot and four *eſchevins;* in moſt other cities a mayor and *eſchevins*. In Languedoc, Provence, and Dauphiné, they are called *conſuls;* at Toulouſe, *capitouls;* and *jurats* at Bourdeaux.

Anciently the *eſchevins* were the aſſeſſors and counſellors of the comites or judges of cities; on which account they were called in ſome places *pairs*, *pares;* they even took cognizance of petty cauſes themſelves.

Du-Cange obſerves, that the judges and their aſſeſſors, who were choſen by the inhabitants, were called *ſcabini* "eſchevins," and their college *ſcabinagium* or "eſchevinage."

In Holland, the *ſcabins* or *eſchevins* judge of all civil affairs at firſt hand. They alſo take cognizance of criminal matters: and if the criminal confeſs himſelf guilty, they can ſee their ſentence executed without appeal. They can even give torture. The number is not the ſame in all cities; at Amſterdam there are nine, at Rotterdam ſeven, &c.

ESCHRAKITES, or Esrakites, a ſect of philoſophers, among the Mahometans, who adhere to the doctrines and opinions of Plato. The word is derived from the Arabic שרק *ſchraca*, which in the fourth conjugation אשרק *aſchraca*, ſignifies "to ſhine, glitter like the ſun;" ſo that *Eſchrakite* ſeems to import "illumined."

The *Eſchrakites*, or Mahometan Platoniſts, place their higheſt good and happineſs in the contemplation of the Divine Majeſty; deſpiſing the groſs imaginations of the Alcoran touching paradiſe. They are very careful in avoiding all vice; they preſerve an equal and eaſy temper, love muſic, and divert themſelves with compoſing little poems or ſpiritual ſongs. The ſhaeicks or prieſts, and the chief among the preachers of the imperial moſques, are Eſchrakites.

ESCLAIRCISSEMENT, a French term adopted into our language, ſignifying the explaining or clearing up of ſome difficulty or obſcurity.

ESCORT, a French term, ſometimes uſed in Engliſh authors, to denote a convoy or company of armed men, attending ſome perſon or thing, in a journey or voyage, to defend or ſecure it from inſults. Some derive the word from the Latin *cohors*.

ESCOUADE, or Squad, is uſually the third or fourth part of a company of foot; ſo divided for mounting guards, and for the more convenient relieving of one another. It is equivalent to a brigade of a troop of horſe. See Brigade.

ESCUAGE, in our old cuſtoms, a kind of knight-ſervice, called *ſervice of the ſhield*, by which the tenant was bound to follow his lord to the wars at his own charge. See the articles Chivalry, *Feodal Syſtem*, and *Knight-Service*.

ESCULAPIUS. See Æsculapius.

ESCULENT, an appellation given to ſuch plants or the roots of them as may be eaten: ſuch are beets, carrots, artichokes, leeks, onions, parſnips, potatoes, radiſhes, ſcorzonera, &c.

ESCURIAL, a royal reſidence of Spain, ſituated about 15 miles north-weſt of Madrid. It is the largeſt and moſt ſuperb ſtructure in the whole kingdom, and perhaps one of the fineſt in Europe. The word is Arabic, meaning "a place full of rocks." It is built in a dry barren ſpot, ſurrounded with rugged mountains, inſomuch that every thing which grows there is owing to art. This place was choſen, it is ſaid, for the ſake of the ſtone wherewith the fabric is built, which is got from a mountain juſt by, and is very durable; and the deſign of erecting it was to commemorate a victory which Philip II. obtained over the French (but by the aſſiſtance of the Engliſh forces) at St Quintin, on St Laurence's day, in the year 1557. The Spaniſh deſcription of this ſtructure forms a ſizeable quarto volume, and it is ſaid that its founder expended upon it ſix millions of ducats. The apartments are decorated with an aſtoniſhing variety of paintings, ſculpture, tapeſtry, ornaments of gold and ſilver, marble, jaſper, gems, and other curious ſtones, ſurpaſſing all imagination. This building, beſides its palace, contains a church, large and richly ornamented; a mauſoleum; cloiſters; a convent; a college; and a library, containing about 30,000 volumes; beſides large apartments for all kinds of artiſts and mechanics, noble walks, with extenſive parks and gardens, beautified with fountains and coſtly ornaments. The fathers that live in the convent are 200, and they have an annual revenue of 12,000l. It was begun by Philip in 1562, five years after the battle; and completed in 22 years. It conſiſts of ſeveral courts and quadrangles, which altogether are diſpoſed in the ſhape of a gridiron, the inſtrument of the martyrdom of St Laurence; the apartment where the king reſides forms the handle. The building is a long ſquare of 640 by 580, and the height up to the roof is all round 60 feet, except on the garden ſide, where the ground is more taken away. At each angle is a ſquare tower 200 feet high. The number of windows in the weſt front is 200; in the eaſt front 366. The orders employed are Doric and Ionic. There are three doors in the principal front. Over the grand entrance are the arms of Spain, carved in ſtone; and a little higher in a nich, a ſtatue of St Laurence in a deacon's habit, with a gilt gridiron in his right hand, and a book in his left. Directly over the door is a baſſo relievo of two enormous gridirons in ſtone. This vaſt ſtructure, however, with its narrow high towers, ſmall windows, and ſteep ſloping roof, exhibits a very uncouth ſtyle of architecture; at the ſame time that the domes, and the immenſe extent of its fronts, render it a wonderfully grand object from every point of view. The church, which is in the centre of all, is large,

large, awful, and richly but not affectedly ornamented. The cupola is bold and light. The high altar is compoſed of rich marbles, agates, and jaſpers of great rarity, the produce of this kingdom. Two magnificent *catafalquas* fill up the ſide arcades of this ſanctuary: on one the emperor Charles V. his wife, daughter, and two ſiſters, are repreſented in bronze, larger than life, kneeling; oppoſite are the effigies of Philip II. and of his three wives, of the ſame materials, and in the ſame devout attitude. Underneath is the burial-place of the royal family, called the *Pantheon*. Twenty-five ſteps lead down to this vault, over the door of which is an inſcription, denoting, that

*Hic locus, ſacer mortalitatis exuviis Catholicorum Regum, &c.*

was intended by Charles the emperor, reſolved upon by Philip II. begun by Philip III. and completed by Philip IV. The mauſoleum is circular, 36 feet diameter, incruſted with fine marbles in an elegant taſte. The bodies of the kings and queens lie in tombs of marble, in niches, one above the other. The plan of theſe ſepulchres is grand, and executed with a princely magnificence; but, as a modern traveller obſerves, in a ſtyle rather too gay, too light, and too delicately fitted up for the idea we are apt to form of a chapel deſtined for the reception of the dead. The collection of pictures diſperſed about various parts of the church, ſacriſty, and convent, has been conſidered as equal, if not ſuperior, to any gallery in Europe except that of Dreſden. Formed out of the ſpoils of Italy, and the waſted cabinet of that unfortunate dilettante Charles I. of England, it contains ſome of the moſt capital works of the greateſt painters that have flouriſhed ſince the revival of the art. In the ſacriſty is an altar called *La ſanta Forma*: this is a kind of tabernacle or *cuſtioda* of gems, marbles, woods, and other precious materials, inlaid in gilt bronze; in which, rather than in the excellence of the workmanſhip or taſte of the deſign, conſiſts the merit of this rock of riches. Before it hangs a curtain, on which Coello has repreſented Charles II. and all his court in proceſſion, coming to place this *Forma*. This is eſteemed one of the moſt curious collections of portraits in the world; for all the perſons are drawn with the greateſt ſtrength of colour and truth of expreſſion, and are ſaid to be perfect reſemblances not only of the monarch and grandees, but even of the monks, ſervants, and guards. The ſtatues, buſts, and medallions of the Eſcurial, are not in any great number, nor very remarkable for their excellence: but the library contains a moſt precious collection of manuſcripts, many fine drawings, and other curioſities. Notwithſtanding the coldneſs of the expoſure, the late king, for the ſake of hunting, uſed to paſs here ſeveral months of the year; and to make the place leſs inconvenient to his attendants and the nobility, he built an entire new town adjoining to it.

ESCUTCHEON, or SCUTCHEON, in heraldry, is derived from the French *eſcuſſon*, and that from the Latin *ſcutum*, and ſignifies the ſhield whereon coats of arms are repreſented.

Moſt nations of the remoteſt antiquity were wont to have their ſhields diſtinguiſhed by certain marks painted on them; and to have ſuch on their ſhields was a token of honour, none being permitted to have them till they had performed ſome honourable action.

The eſcutcheon, as uſed at preſent, is ſquare, only rounded off at the bottom.

ESDRAS, a Jewiſh prieſt, and doctor of the law. Artaxerxes Longimanus ſent him with rich preſents for the uſe and ornament of the temple at Jeruſalem, rebuilt under Zerubbabel; the king alſo ordered the neighbouring governors to provide him with what conduced to the pomp of the Jewiſh religion, and to exempt the prieſts from paying taxes. He is ſuppoſed to be the collector of the Canon of Scripture; and that, by divine inſpiration, he added ſome things which happened after the deaths of the authors. It is gueſſed he wrote the Chronicles, beſides thoſe books which bear his name, the two laſt of which are exploded even by the church of Rome.

ESK, the name of ſeveral rivers both in England and Scotland, particularly of one which forms part of the boundary between the two kingdoms. It runs from north-eaſt to ſouth-weſt, and gives name to the county of Eſkdale.

ESKI-HISSAR. See STRATONICEA.

ESKIMAUX. See ESQUIMAUX.

ESNE, a conſiderable ſea-port town of Upper Egypt. It is governed by an Arabian prince, and by a cachef, dependant on the bey of Girze. The Mahometans have ſeveral moſques here, and the coptis a church ſerved by two prieſts. "Eſne (ſays Abulfeda), remarkable for its public baths and its commerce, is built on the weſtward of the Nile, between Aſſouan and Cous, but nearer to this latter. It acknowledges, adds the geographer of Nubia, the coptis for founders. Its well cultivated territory abounds in grain and palm trees. It is ſurrounded by gardens filled with fruit trees. One admires here ſeveral ancient monuments conſtructed by the coptis, and ſuperb ruins." This deſcription anſwers to Eſne in our time, which is ſituated on the edge of a rich country, and ſhaded by groves of orange trees loaded with fruits and flowers. This town, formerly called *Latopolis*, revered Minerva and the fiſh *Latus* (Strabo). It contains within its boundary an antique temple; thick walls incloſe it on three ſides. Six large fluted columns, crowned by a capital ornamented with the palm leaf, form the facade of it; 18 others ſupport the roof, which is compoſed of large ſquares of marble; the building is ſurrounded by a freeze, and innumerable hieroglyphics cover its exterior aſpects.

A little to the ſouth of the town are ſeen the ruins of a monaſtery founded by St Helena, and near it the burying place of the martyrs, adorned with tombs crowned by cupolas, ſupported by arcades. The inhabitants of Eſne having revolted againſt the perſecution of Diocleſian, that emperor deſtroyed this town and put them to the ſword. This place, conſecrated by religion, is become a celebrated pilgrimage among the Coptis. They repair thither from the moſt diſtant provinces of the kingdom. In the chain of mountains which ſtretches to the eaſtward of the Nile, and nearly oppoſite Eſne, are quarries of a ſoft ſtone, called *Baram*. It is made uſe of for kitchen utenſils. It hardens in the fire, and forms excellent kettles and pans, which give no bad taſte to the victuals.

ESOX, in ichthyology, a genus of fiſhes belonging to the order of abdominales. The body is elongated; the head is plainiſh above; the upper jaw is plain, and ſhorter than the under one, which is dotted; and the branchioſtege membrane has from ſeven to twelve rays.

1. The Lucius, or Pike, has a flat head: the upper jaw is broad, and ſhorter than the lower: the under jaw turns up a little at the end, and is marked with minute punctures. The teeth are very ſharp, diſpoſed only in the front of the upper jaw, but in both ſides of the lower; in the roof of the mouth, and often in the tongue. The ſlit of the mouth, or the gape, is very wide; the eyes ſmall. The pike is common in moſt of the lakes of Europe; but the largeſt are thoſe taken in Lapland, which, according to Scheffer, are ſometimes eight feet long. They are taken there in great abundance, dried, and exported for ſale. The largeſt fiſh of this kind ſaid to be caught in England, weighed 35 pounds. All writers who treat of this ſpecies bring inſtances of its voraciouſneſs. It hath been known to choke itſelf by attempting to ſwallow one of its own ſpecies which proved too large a morſel. Yet its jaws are very looſely connected, and have on each ſide an additional bone like the jaw of a viper, which renders them capable of greater diſtenſion when it ſwallows its prey. It does not confine itſelf to feed on fiſh and frogs; it will devour the water-rat, and draw down the young ducks as they are ſwimming about. But there are inſtances of its fierceneſs ſtill more ſurpriſing, and which indeed border a little on the marvellous. Geſner relates, that a famiſhed pike in the Rhone, ſeized on the lips of a mule that was brought to water, and that the beaſt drew the fiſh out before it could diſengage itſelf; that people have been bit by theſe voracious creatures while they were waſhing their legs; and that the pike will even contend with the otter for its prey, and endeavour to force it out of its mouth. Small fiſhes ſhow the ſame uneaſineſs and deteſtation at the preſence of this tyrant, that the little birds do at the ſight of the hawk or owl. When the pike lies dormant near the ſurface, as is frequently the caſe, the leſſer fiſhes are often obſerved to ſwim around it in vaſt numbers and in great anxiety. Pikes are often haltered in a nooſe, and taken while they thus lie aſleep, as they are often found in the ditches near the Thames, in the month of May. In the ſhallow water of the Lincolnſhire fens they are often taken in a manner, we believe, peculiar to that country and to the iſland of Ceylon. The fiſherman makes uſe of what is called a *crown net;* which is no more than a hemiſpherical baſket, open at top and bottom. He ſtands at the end of one of the little fen-boats, and frequently puts his baſket down to the bottom of the water; then poking a ſtick into it, diſcovers whether he has any booty by the ſtriking of the fiſh; and vaſt numbers of pike are taken in this manner. The longevity of this fiſh is very remarkable, if we may credit the accounts given of it. Rzaczynſki tells us of one that was 90 years old; but Geſner relates, that, in the year 1497, a pike was taken near Hailbrun in Suabia, with a brazen ring affixed to it, on which were theſe words in Greek characters: "I am the fiſh which was firſt put into this lake by the governor of the univerſe, Frederick the Second, the 5th of October 1230:" So that the former muſt have been an infant to this Methuſalem of a fiſh. Pikes ſpawn in March or April, according to the coldneſs or warmneſs of the weather. When they are in high ſeaſon, their colours are very fine, being green, ſpotted with bright yellow; and the gills are of a moſt vivid and full red. When out of ſeaſon, the green changes to a grey, and the yellow ſpots turn pale.

2. The Belone, or Gar, ſometimes grows to the length of three feet or more. The jaws are very long, ſlender, and ſharp-pointed; the under jaw extends much farther than the upper; and the edges of both are armed with numbers of ſhort and ſlender teeth: the tongue is ſmall: the eyes are large; the irides ſilvery; the noſtrils wide and round. The body is ſlender, the belly quite flat, bounded on both ſides by a rough line. The tail is much forked. The colours are extremely beautiful when the fiſh is in the water: the back is of a fine green, beneath which appears a rich changeable blue and purple: the ſides and belly are of a fine ſilvery hue. This fiſh, which is found in many places, is known by the name of the *ſee-needle*. It comes in ſhoals on our coaſts in the beginning of ſummer, and precedes the mackerel: it has a reſemblance to it in taſte; but the light green which ſtains the back-bone of this fiſh gives many people a diſguſt to it.

3. The Saurus, or Saury, is 11 inches in length: the noſe ſlender; the jaws produced like thoſe of the ſea-needle, but of equal length: the eyes large: the body anguilliform; but towards the tail grows ſuddenly ſmaller, and tapers to a very inconſiderable girth. The tail is much forked: the back duſky: the belly bright and ſilvery. Great numbers of theſe fiſh were thrown aſhore on the ſands of Leith near Edinburgh, after a great ſtorm in November 1768. Rondeletitius deſcribes this ſpecies among the fiſh of the Mediterranean; but ſpeaks of it as a rare kind.

4. The Barracuda of Cateſby, is found in great numbers about the ſeas of the Bahamas and as far as Jamaica. Its body and head very much reſemble the European pike: the eyes are large: the mouth is very wide: the under jaw longer than the upper: there are four very large and ſharp teeth in the front of the upper jaw; in that of the lower, a ſingle great and ſharp tooth: there are two dorſal fins: the tail is large and forked: colour a deep brown, whitiſh on the belly. It grows to the length of 10 feet. It ſwims exceedingly ſwift, and is of dreadful voracity: will attack and devour men when they are bathing. The fleſh has a diſagreeable ſmell and taſte, and is frequently poiſonous; cauſing great ſickneſs, vomiting, intolerable pains in the head, and loſs of hair and nails: yet the hungry Bahamans formerly were under the neceſſity, at times, of feeding on it.

ESPALIERS, in gardening, are rows of trees planted about a whole garden or plantation, or in hedges, in ſuch a manner as to incloſe quarters or ſeparate parts of a garden; and are trained up regularly to a lattice of wood-work in a cloſe hedge for the defence of tender plants againſt the injuries of wind and weather. They are of admirable uſe and beauty in a kitchen-garden, ſerving not only to ſhelter the tender plants, but ſcreen them from the ſight of perſons in the walks.

The trees chiefly planted for eſpaliers, are apples, pears, and ſome plums: ſome plant apples grafted upon paradiſe-ſtocks: but as theſe are of ſhort duration, it is better to plant thoſe grafted upon crabſtock, or

upon

upon what the gardeners call *Dutch-ſtocks;* which will both cauſe them to bear ſooner, and prevent their growing too luxuriant. The beſt kind of apple for this purpoſe, are the golden pippen, nonpareil, rennet, &c. and the beſt ſort of pear, are the jargonelle, blanquette, &c. Theſe laſt, if deſigned for a ſtrong moiſt ſoil, ſhould be grafted upon quince-ſtocks; but if for a dry ſoil, upon free-ſtocks.

While the trees are young, it will be ſufficient to drive a few ſtakes into the ground on each ſide of them; faſtening the branches to theſe in an horizontal poſition, as they are produced. This method will do for the three firſt years; after which an eſpalier ſhould be made of aſh-poles, whereof there muſt be two ſorts, larger and ſmaller: the former to be driven upright into the ground a foot aſunder, and the latter, or ſlender poles, to be nailed acroſs theſe, at about nine inches. Some prefer to this another ſort of eſpalier, made of ſquare timber cut to any ſize: theſe are, indeed, more ſightly, but withal vaſtly more expenſive.

When the eſpalier is thus framed, the branches are to be faſtened to it with oſier-twigs; obſerving to train them in an horizontal poſition, and at equal diſtances. Fruit-trees thus managed are preferable to any others; not only as bearing better-taſted fruit, but as taking up very little room in a garden, ſo as to be leſs hurtful to plants which grow in the quarters.

ESPLANADE, in fortification, the ſloping of the parapet of the covered-way towards the campaign.

ESPLEES, in law, the general products which lands yield, or the profit or commodity that is to be taken or made of a thing.

ESPOUSALS, in law, ſignify a contract or promiſe made between a man and a woman to marry each other; and in caſes where marriages may be conſummated eſpouſals go before. Marriage is termed an eſpouſal *de præſenti.*

The eſpouſals amongſt the Jews were either by writing, or by a piece of ſilver given and received, or by cohabitation. Amongſt the Greeks, after the parents and friends of the young couple had finiſhed their negociation, the couple themſelves pledged their faith to each other, the man ſwearing that he would be conſtant and true, the woman that ſhe would marry him, and make him maſter of all ſhe had. Then they ratified their agreement by a kiſs and joining right hands.

Amongſt the Romans the eſpouſals conſiſted in an engagement of friends on both ſides, whether abſent or preſent, in public or without witneſſes. But the common way was by writings drawn up by common conſent, and ſealed by both parties; beſides this, the man ſent a ring to the woman, conſiſting of iron and without a ſtone.

ESQUILIÆ (anc. geog.), one of the ſeven hills of Rome, which Varro will have to be two, viz. Ciſpius and Oppius; alſo Mons Eſquilinus, ſoftened from Exquilinus; and this again from Excubinus, the watch or guard Romulus kept here, from a jealouſy he entertained of his colleauge Titus Tatius. On the eaſt ſide it reached the city walls; on the ſouth, the Via Lavicana; on the weſt, the wide valley between mount Coelius and the Palatine; on the north, the Mons Viminalis; on the eaſt ſide was the Porta Eſquilina. This hill by ſome of the ancients was called *Suburranus,* from the ſtreet *Suburra* to the north of it: by the poets, *Eſquilius.*

ESQUIMAUX, a people of North America inhabiting all that vaſt tract of land known by the name of *Labrador,* or *New Britain.*—They differ very conſiderably, both in aſpect and behaviour, from the other American nations; agreeing in moſt reſpects with the inhabitants of Weſt Greenland. See *New Britain,* and Greenland.

ESQUIRE (from the French *eſcu,* and the Latin *ſcutum,* in Greek σκυτος, which ſignifies an hide, of which ſhields were anciently made, and afterwards covered; for, in the time of the Anglo-Saxons, the ſhields had a covering of leather), was originally he who, attending a knight in time of war, did carry his ſhield; whence he was called *eſcuier* in French, and *ſcutifer,* or *armiger,* i. e. armour-bearer, in Latin. Hotoman ſays, that thoſe whom the French call *eſquires,* were a military kind of vaſſals, having *jus ſcuti,* viz. liberty to bear a ſhield, and in it the enſigns of their family, in token of their gentility or dignity. But this addition hath not of long time had any relation to the office or employment of the perſon to whom it hath been attributed, as to carrying of arms, &c. but hath been merely a title of dignity, and next in degree to a knight. For thoſe to whom this title is now due, ſee the article Commonalty. Officers of the king's courts, and of the king's houſehold, counſellors at law, juſtices of the peace, are only *eſquires* in reputation; and he who is a juſtice of peace has this title only during the time he is in commiſſion, and no longer, if he is not otherwiſe qualified to bear it. A ſheriff of a county being a ſuperior officer, bears the title of *eſquire* during his life; in reſpect of the great truſt he has in the commonwealth. The chief of ſome ancient families are eſquires by preſcription; and in late acts of parliament for poll-money, many wealthy perſons commonly reputed to be ſuch, were ranked among the eſquires of this kingdom.

There is a general opinion, that every gentleman of landed property who has L.300 a-year, is an eſquire; which is a vulgar error: for no money whatſoever, or landed property, will give a man properly this title, unleſs he comes within one of the above rules: and no perſon can aſcribe this title where it is not due, unleſs he pleaſes; there being no difficulty in drawing the line by the accounts given above and in the article Commonalty: but the meaner ranks of people, who know no better, do often baſely proſtitute this title; and, to the great confuſion of all rank and precedence, every man who makes a decent appearance, far from thinking himſelf any way ridiculed by finding the ſuperſcription of his letters thus decorated, is fully gratified by ſuch an addreſs.

Esquires *of the King,* are ſuch as have that title by creation, wherein there is ſome formality uſed, as the putting about their necks a collar of SS, and beſtowing on them a pair of ſilver ſpurs, &c.

ESRAKITES. See Eschrakites.

ESSAY, a trial or experiment for proving the quality of any thing; or an attempt to learn, whether or not any invention will ſucceed.

Essay, in literature, a peculiar kind of compoſition, the character whereof is to be free, eaſy, and natural;

tural; not tied to ſtrict order or method, nor worked up and finiſhed like a formal ſyſtem.

ESSAYING, or Assaying, in chemiſtry and metallurgy, ſignifies the examination of a ſmall quantity of any ore or mineral by fire, in order to diſcover its contents. This is very neceſſary for thoſe who intend to deal largely in metallurgic operations, in order to avoid unneceſſary expence, by becoming previouſly acquainted with the nature of the ore.

1
Hiſtory of the art.

The firſt attempts in this way were no doubt extremely rude; but ſucceeding trials have advanced it to the form of a ſcience or art practiſed by numbers of people under the title of *eſſay-maſters*. No treatiſe was publiſhed on this ſubject till after the middle of the 16th century; and the firſt book we have upon it is attributed to Lazarus Ercker, which appeared in 1574. Agricola, however, in his ſeventh book *De re Metallica*, publiſhed in 1576, deſcribed both the inſtruments and proceſſes, illuſtrating the whole with plates; and there is inconteſtable evidence that this treatiſe had been preſented to the elector of Saxony in 1567, tho' it did not appear to the world till after the publication of Ercker's book. Since that time, the art has been greatly improved; but the operations in the dry way are not materially different from thoſe deſcribed under Metallurgy. The Blow-pipe likewiſe affords an excellent method of examining ſmall quantities of metal in the dry way; but the greateſt improvement hitherto made in it is that of eſſaying by the moiſt way introduced by Mr Bergman.

2
The moiſt way of eſſaying introduced by Mr Bergman.

3
Requiſites for eſſaying in the dry way.

This celebrated chemiſt obſerves, that in the *Docimaſia Sicca*, or eſſaying in the dry way, three things are requiſite: 1. That the metal contained in the ore be all reduced to a complete form; for ſuch part of it as is deficient in that reſpect cannot be united with the eliquated metal. 2. That the whole be collected into one maſs; for when it is diſperſed in numerous ſmall grains, ſome of them are very eaſily ſcattered, and diminiſh the weight. 3. That the metallic form be preſerved; for the extracted regulus muſt inevitably be diminiſhed more or leſs by calcination. All theſe requiſites are frequently effected conveniently enough in a crucible by fuſion with proper ſtrata of charcoal, provided the ore is free from ſulphur and other volatile mixtures, and is entirely without a matrice, or united to one that can be melted by a moderate degree of heat; but if the matrice be refractory, notwithſtanding the moſt ſubtile pulveriſation, it will cover many of the metallic particles, and thus the reduction and fuſion will be in ſome meaſure prevented. When this happens to be the caſe, we muſt add ſuch other ſubſtances as not only promote fuſion, but make the matter flow ſufficiently thin to allow the reguline particles to fall to the bottom. Theſe ſubſtances, which from the effect they have on the matter are called *fluxes*, are of a ſaline nature, and muſt therefore neceſſarily corrode the metals more or leſs; and hence the ſcoria, which are almoſt always tinged, contain a quantity of calcined metal. But as long as we are deſtitute of a ſure method of meaſuring intenſe degrees of heat, and as long as it is neceſſary to perform the operation in cloſe veſſels to prevent the acceſs of air, the force and proper continuance of the fire will be uncertain (A). Now, by every exceſs or defect in this point ſome part of the regulus is loſt; ſo that any judgment of the goodneſs of the ore, formed from the weight of the regulus, muſt be fallacious, or at leaſt ſomewhat inaccurate.

4
Deficien f the d way of ſaying.

Hence we may underſtand, that experiments upon ores made in the dry way, are liable to many faults and imperfections; to which we may add the following, viz. that a given quantity of ore ſubjected to trial almoſt always exceeds in weight the regulus to be extracted from it. Now, ſince it is impoſſible to avoid a certain loſs both during calcination and fuſion, this loſs will be the more remarkable, as the maſs to be weighed becomes ultimately lighter. The caſe is quite otherwiſe with experiments made in the moiſt way; for here the weighty ſediment, from which the quantity of the contents is judged, is never leſs, but often greater, than that obtained by fire.

5
Metho eſſaying the mo way pr ous to B man's i rovem

In the attempts made to eſſay ores in the humid way previous to thoſe of Mr Bergman, both methods were uſed, the metallic part being extracted by a menſtruum, and afterwards reduced by fire. Our author, however, has now ſhown a method of performing the operation without either calcination or fuſion. "It muſt indeed be confeſſed (ſays he), that experiments in the humid way often require more care and pains than the other; but if accurate concluſions are thereby obtained, we ought not to grudge the ſlowneſs. Beſides, in many caſes this method is more expeditious than the other; and indeed almoſt always, if we content ourſelves with ſuch diſcoveries as can be made by the common calcinations and fuſions: nay, ſometimes the dry method is obviouſly inſufficient, when the metallic content is either very ſmall or volatile; but particularly if it be inflammable, as is the caſe with zinc."

6
Di ecti for eſſa in the m way.

In this method the ores to be examined ſhould be reduced to to a very ſubtile powder by pulverization and calcination. In diſſolving ſuch ores as contain ſulphur, we ought to employ the vitriolic or marine acid; for the nitrous, by long continued heat, deſtroys the ſulphur. Too great heat alſo diſſipates ſome of it in vapours, or melts it into globules containing heterogeneous matters; therefore boiling ought to be avoided where it can be done. All the precipitates muſt be carefully collected, waſhed, and dried. Diſtilled water ought conſtantly to be uſed, and all the menſtrua carefully depurated. Vitriolic acid our author calls *diluted*, when its ſpecific gravity is below 1.3, the nitrous when below 1.2, and the marine when below 1.1. The precipitations ſhould be carefully made in glaſs veſſels; ſo that nothing may remain either through the deficiency of the precipitant, or be rediſſolved through its too great quantity. The clear liquor is to be decanted from the precipitate, water poured on in its place, the veſſel ſhaken, and then ſuffered to ſtand; the water again decanted off, and more poured on in its ſtead, until it will no longer affect certain precipitants by which it muſt be examined. The ſediment is then to be collected on a filter, the latter being previouſly weighed,

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(A) The newly-invented thermometer of Mr Wedgewood has furniſhed us with a method of meaſuring intenſe degrees of heat; but we have not yet heard how far this has been found uſeful in practice.

weighed, and made of paper not impregnated with alum. It is to be dried at firſt with a gentle heat, but afterwards expoſed for five minutes to a heat of 100°. On cooling, it is to be weighed together with the filter; the known weight of which muſt afterwards be ſubtracted. The ſediment is beſt waſhed in a bottle; for a filter when once impregnated with ſaline matter cannot be freed from it again without great difficulty, eſpecially if an interval of ſome hours intervenes.

7
ka'ies re and logiſtica-, uſed by - Berg- n.

The alkali made uſe of in Mr Bergman's experiments, was that of ſoda ſaturated with aerial acid. His phlogiſticated alkali is made by deflagrating equal weights of pure nitre and cream of tartar intimately mixed together; the reſiduum is the common white flux. Half an ounce of this is diſſolved in half a quadrans of diſtilled water. To this he adds, in a digeſting heat, two ounces of Pruſſian blue, carefully avoiding ſuch an effervescence as may throw any thing over, which eaſily happens if the quantity be too large. The pigment ſoon loſes its beautiful blue colour, growing not red but black; which ſhows that a decompoſition has taken place. The Pruſſian blue uſed in his experiments contained in 100 parts only 23 of the pigment and 77 of the clay; ſo that if we employ the blue made without any alum, 221 grains of it will ſaturate the half ounce of alkaline ſalt more completely than the two ounces of the kind already deſcribed. But in whatever manner the operation is performed, after the addition of the laſt quantity, the whole muſt be expoſed to a ſtronger digeſting heat, and ſtirred with a wooden ſpatula. If the liquor be too much diminiſhed by evaporation, the defect muſt be ſupplied by adding more water. When the liquor becomes clear, the reſiduum muſt be collected upon filtering paper, and gradually waſhed with warm water until all the ſoluble part is extracted; when, if the operation has been properly conducted, the filtered liquor amounts to a whole quadrans, of a browniſh yellow colour, and ſo well ſaturated with colouring matter, that it does not change the colour of paper tinged with Braſil wood. This lixivium, however, contains a ſmall quantity of Pruſſian blue, about 4 lb. to a cwt. of the alkali. Theſe ſhould be previouſly ſeparated by an acid, or, which is better, corrected by ſubtracting from the weight of the ſediment 16 eſſay pounds for each quadrans of the lixivium. When we wiſh to examine the colour of the precipitate exactly, however, the lixivium we employ muſt neceſſarily be well depurated; for by neglecting this precaution we may eaſily perſuade ourſelves that any metal precipitated by the lixivium has a blue colour. When we only wiſh to aſcertain the weight, the lixivium, having the ſmall proportion of Pruſſian blue intermixed, may be employed: but ſtill the proper correction muſt ultimately be made uſe of; for the precipitating acid is wont to impair the qualities of the lixivium, and even to deſtroy them altogether, eſpecially in a warm temperature. Calcareous earth, whether in its mild or cauſtic ſtate, is alſo capable of abſtracting a coloured ſubſtance from iron and other metals.

8
' to p'tate 's by ls.

In the precipitation of metals by metals, it is to be obſerved, that the acid of the ſolution ought to be ſomewhat predominant; but any conſiderable exceſs muſt be corrected occaſionally, either by alkali, water, or ſpirit of wine.

9
Weights uſed in Mr Bergman's experiments.

In the following experiments an eſſay cwt. was always employed, unleſs where it is expreſsly mentioned otherwiſe: concluſions ſufficiently accurate may indeed be obtained from 25 lb. nay ſometimes from ſmaller quantities. In theſe caſes our author mentions the uſual quantity; applying to them thoſe formulæ of calculation which are founded on the mutual proportions of the proximate principles conſtituting metallic ſalts. By an eaſy ſubſtitution, the ſame formulæ may be uſed by thoſe who employ $\frac{1}{4}$ or $\frac{1}{2}$ cwt. We now come to deſcribe the method of eſſaying the ores of the particular metals.

10
How to eſſay the ores of gold.

1. *Ores of Gold.* This metal occurs in the bowels of the earth native, poſſeſſing a complete metallic form, although in general the ſmall particles of it are ſo interſperſed in various matrices, that they are entirely inviſible. It is alſo found mineralized, or united with ſulphur by means of iron or ſome other metal. Theſe two ſpecies of ore we ſhall conſider ſeparately.

11
Native gold.

Native gold is very ſeldom, if ever, free from heterogeneous matters; the moſt uſual mixtures are copper, ſilver, and ſometimes iron. The firſt of theſe remains in the menſtruum, and may be ſeparately collected by diſſolving the gold in aqua-regia, and precipitating it by martial vitriol: the ſecond falls during the ſolution, yielding a ſalited ſilver; which, being waſhed and dried, ſhows the weight of the ſilver contained; and the iron may be diſcovered by phlogiſticated alkali. The precipitate occaſioned by martial vitriol is pure gold in its metallic ſtate, but very ſubtilely divided, and therefore its weight requires no correction.

Hence it appears how ſmall a portion of gold inherent in the ores of other metals may be extracted; beſides, a ſolution containing the moſt minute particle of gold inſtantly produces the purple precipitate of Caſſius, with a ſolution of tin properly prepared.

12
Ores of this metal properly ſo called.

As to the ore which contains gold adhering to and ſurrounded by ſtony particles, 1. We muſt reduce a determined weight to an impalpable powder by triture and elutriation. Then let the powder, weighed a ſecond time, be boiled in aqua regia, as long as any thing is taken up by the menſtruum; after which, let the exhauſted ore, well waſhed, be collected, exſiccated to ignition, and weighed. Let the clear ſolution (the colour of which, in ſome degree, affords a method of judging) be precipitated in the uſual way by martial vitriol; the precipitate well waſhed, dried, and weighed, ſhows the gold, which, added to the weight of the exhauſted ore, ought to be equal to the original weight, unleſs ſomewhat has been diſperſed by the pulveriſation, or unleſs ſome of the matrice has entered the menſtruum. The former of theſe is diſcovered by comparing the weights before and after pulveriſation; the latter by precipitants.

When grains of gold are mixed with looſe earthy particles, they are ſometimes eaſily ſeparated by mechanical application of water.

13
Gold mineralized by ſulphur.

When the metal is mineraliſed by ſulphur, as in the golden pyrites, let one or more eſſay cwts. reduced to powder be gently boiled in the nitrous acid, or rather digeſted in a heat of 50°—80°, leſt the ſulphur ſhould be deſtroyed. It is even neceſſary to employ a more gentle heat for this purpoſe, that the ſulphureous particles, gradually ſeparating, may remain in their natural ſtate; for if they melt, the heterogeneous particles, which ought to have been removed, will be incloſed in the melted maſs. The menſtruum ought to be added in ſeveral portions, about ſix times the quantity of the ore at each turn. The pyrites is acted upon by this menſtruum; an efferveſcence enſues, which continues for ſome time; after which a freſh quantity of the acid is to be added, until the ſulphur is obtained pure and of its proper colour. From 12 to 16 parts of the acid are uſually required to one of the ore. The purity of the ſulphur is eaſily aſcertained by cauſtic alkali.

The matrice, if inſoluble in the menſtruum, remains at bottom, together with the gold; which is diſtinguiſhed by its peculiar colour and ſplendor, and may be ſeparated from the matrice by careful elutriation. The particles of gold aſſume the form of very ſmall grains, yet ſuch as have angular points diſcernible by a good eye; and their appearance gives ſome reaſon for ſuppoſing that they have rather been intimately mixed with the pyrites than diſſolved in it. The clear ſolution, which is generally green, muſt be evaporated, made red hot, and then weighed. Any other metals that happen to be preſent beſides iron, may be extracted by ſuitable menſtrua; as copper by the volatile alkali, manganeſe by dilute nitrous acid, with the addition of a little ſugar: zinc is ſcarce ever met with in gold pyrites; but if it ſhould happen to exiſt, may be extracted by any menſtruum; and ſilver by pure nitrous acid. Calcareous earth, when it happens to form the matrice, unites with nitrous acid, and clay with that of vitriol. The ſum of the weights of all the ingredients ought to be equal to the original weight of the ore; and unleſs any loſs has been ſuſtained during the operation, any deficiency may be attributed to the conſumption of the ſulphur.

14 Of platina.

2. *Ores of Platina.* The only metal with which platina is known to be alloyed is iron. This may be ſeparated in a great meaſure by boiling the grains of platina, reduced to as fine a powder as poſſible, in marine acid, by which the original weight of the grains is generally reduced by about 0.05 of the whole. The depurated platina, diſſolved in aqua-regia, eaſily diſcovers itſelf by precipitation with martial vitriol, if any gold be preſent: and, on the other hand, if platina contains a ſmall quantity of gold, the latter may be diſcovered by any neutral ſalt containing vegetable or volatile alkali.

15 Of ſilver,

3. *Ores of Silver.* This metal, when found in its native ſtate, is generally alloyed with gold or copper, or both. The ſilver and copper will be taken up by nitrous acid, leaving the gold at bottom in the form of a black powder, which may be made to aſſume a more metallic apppearance by ſolution in aqua-regia and precipitation by martial vitriol. The copper remaining in the ſolution may then be collected by means of iron or aerated alkali.

16 Mineralized by various ſubſtances.

Silver united with ſulphur alone (the glaſſy ore of ſilver) is of a black colour. To diſcover the contents of this ore, let it be divided and powdered as much as poſſible, and then gently boiled for an hour in 25 cwt. of diluted nitrous acid: then after decantingthe liquor, the operation is to be repeated with an equal quantity of the menſtruum; and even a third time, unleſs the pure ſulphur be now ſeparated. The laſt particles of the ſilver adhere obſtinately to the ſulphur. If any gold be preſent, it remains undiſſolved at the bottom of the veſſel. The decanted liquors being collected, are to be deprived of the ſilver by adding common ſalt; then if we ſuppoſe the precipitate when collected, waſhed, and dried, to be $=a$, the ſilver required will be $\frac{100a}{129}$. The weight of the ſulphur added to the above ought to be 100 lb. if the operation has been rightly performed, and no decompoſition of the ſulphur taken place. The clear liquor, which paſſes in filtering the luna cornea, eaſily diſcovers any other metal which may originally have been mixed with the ſilver; after which, the earth may be precipitated by means of a common fixed alkali.

It is difficult to ſeparate the remains of the matrice from the ſulphureous particles. To effect this, however, let the ſum of the weights be firſt obſerved; then pour on cauſtic lixivium, which will diſſolve the ſulphur by a gentle digeſting heat; the matrice then remains alone, and by its weight we can determine that of the ſulphur; but we muſt not continue the digeſtion longer than is neceſſary to diſſolve the ſulphur, leſt ſome of the ſiliceous earth ſhould alſo be taken up, tho' Mr Bergman thinks there is no great reaſon to apprehend any inconvenience of this kind.

17 Red ſilv ore.

The red ore of ſilver may be examined by reducing it to a very ſubtile powder, and boiling it twice gently in diluted nitrous acid. A part of the menſtruum being decanted off, waſh the reſiduum well, then precipitate the ſilver by means of ſea-ſalt; boil the above-mentioned white powder quickly in aqua-regia until the arſenic be diſſolved and the ſulphur appear pure. The yellow ſolution, cautiouſly decanted, lets fall a very white powder on the addition of a proper quantity; and the ſmall quantity taken up by the water may be obtained by evaporating to dryneſs. The ſulphur ſeparated in this manner, though it ſeems pure, yet contains ſome ſilver which the nitrous acid could not diſſolve on account of the arſenic contained in the ore; but when this is taken away by the aqua-regia, the remaining parts of the ſilver adhere to the marine acid entangled among the ſulphureous particles. This luna cornea may be freed from the ſulphur by cauſtic volatile alkali diluted with water, and kept in a well-cloſed veſſel for ſome days. A weight of alkaline liquor equal to that of the ſulphur is ſufficient. By weighing the ſulphur both before and after the operation, we know the weight of it as well as the luna cornea. Iron may be diſcovered by means of the phlogiſticated alkali.

18 White o

The white ore of ſilver, conſiſting of the metal united with ſulphur, arſenic, and copper, is eſſayed in the following manner. Let 1 cwt. of the ore, reduced to powder, be gently boiled for an hour in a little more than 12 times its weight of diluted nitrous acid. The dry powder becomes black, foul, and ſends forth the ſmell of hepar ſulphuris. Part of it is diſſolved, and a white reſiduum remains at length at the bottom. The liquor cleared by ſubſiding or filtration, contains the ſilver and copper; the former cannot be precipitated alone by ſea-ſalt, becauſe the marine acid attracts the copper more ſtrongly. A white precipitate indeed, conſiſting of ſmall needle-like cryſtals, is thrown down; but it is found on examination to conſiſt of a peculiar combination of marine acid, ſilver, and copper. The ſilver therefore muſt be precipitated by a determined weight of copper, and the latter may be afterwards ſeparated by iron or mild fixed alkali; but from the ultimate weight we muſt ſubtract that of ſuch part of the precipitant as has entered the menſtruum. The white menſtruum muſt next be boiled in marine acid, and precipitated by water; by which means we obtain the arſenic, along with a ſmall quantity of marine acid which it retains obſtinately. After the ſeparation of the arſenic, it remains only to prove the purity of the ſulphur by volatile alkali, in order to determine whether it ſtill contains any luna cornea, or copper.

19 ineralized by ſul-ur.

Silver mineralized by ſulphur ſometimes contains antimony alſo; and this ore often appears in the form of capillary threads of an hoary brown colour. To analiſe this, let it be gently boiled, or rather digeſted, for an hour, in ſix times its weight of diluted nitrous acid, until the ſilver is thoroughly diſſolved, and all the antimony reduced to a white calx; which, after decanting the liquor, may be ſeparated from the ſulphur by marine acid, and precipitated by water. The ſolution of ſilver may be precipitated by ſea-ſalt, and 1 cwt. ſeldom contains more than four ounces. Sometimes there is preſent in this kind of ore a little copper and iron beſides the ſulphur and antimony; in which caſe we may conduct the experiment in the ſame manner, only with the addition of a double portion of acid. All the metals are eaſily obtained by precipitating the ſilver by copper, and the iron by zinc or an alkaline ſalt.

20 rneous ver ore.

The corneous ſilver ore, in which the metal is mineralized by the marine and vitriolic acids, has two remarkable varieties; one of which may be cut, and is ſomewhat malleable; the other brittle, and containing ſome ſulphur beſides the acid. An hundred parts of the former, reduced to a fine powder, is to be digeſted for one day in marine acid, ſhaking the mixture from time to time. The liquor is then to be decanted clear, and the reſiduum, previouſly well waſhed in water, added to the liquor. A ſolution of terra ponderoſa is to be gradually dropped into the liquor, until it ceaſes to occaſion any precipitation. Suppoſe the weight of the precipitate, waſhed and dried, $=a$: now vitriolated terra ponderoſa, whoſe weight is $a$, contains of acid $0.15a$, which correſponds with vitriolated ſilver $0.48\,a$; for from 100 lb. of vitriol of ſilver, 68.75 of metal is obtained by reduction. But as all the ſilver is not precipitated from nitrous acid by mineral alkali combined with vitriolic acid, the luna cornea will therefore be $100-0.48a$. In the former ſalt, the ſilver contained is expreſſed by $0.33\,a$; in the latter, by $75.19-0.36\,a$; and therefore the ſum required for the 100 will be $75.19-0.03\,a$. The brittle corneous ore likewiſe contains ſulphur; but the ſaline part may be extracted by volatile alkali, and the quantity of metal afterwards aſcertained by the method already deſcribed. Or this compound may be reduced in the following manner: Let the maſs be mixed with an equal bulk of alkaline ſalt in a glaſs mortar, and be formed into a globule by means of a few drops of water: let this globule be put into a crucible, the bottom of which has been previouſly ſtrewed with ſal ſodæ, compreſſed, and covered with the ſame alkali. On applying a melting heat, the whole of the metal will then be reduced if the luna cornea has been properly collected.

21 Native mercury.

4. *Ores of Mercury.* Native quickſilver is ſeldom mixed with any other metals than gold, ſilver, and biſmuth. The firſt remains at the bottom on diſſolving the fluid maſs in nitrous acid; the ſecond is diſcovered by ſea-ſalt, which at the ſame time precipitates the mercury combined with ſea-ſalt; and the third, though it is taken up by the ſpirit of nitre, is yet precipitated by the mere affuſion of water.

22 Cinnabar.

The combination of quickſilver with ſulphur (native cinnabar) cannot be decompoſed either by vitriolic, nitrous, or marine acid. Our author has even attempted in vain to diſunite them by boiling for many hours in a ſolution of cauſtic fixed alkali in water. There are, however, he tells us, two ways of effecting a perfect decompoſition; one by gently boiling for an hour the cinnabar with eight times its weight of an aqua regia, one fourth of which is marine acid; the other by boiling it in marine acid, with the addition of one tenth of the weight of the cinnabar of the black calx of manganeſe; but the former method is preferable, as no heterogeneous matter is thus added to the mercury. The menſtruum is the ſame in both, *viz.* the dephlogiſticated marine acid; the only difference is, that in the former method it is dephlogiſticated by the nitrous acid, and in the latter by the manganeſe. In whatever manner, however, the ſulphur be ſeparated, it may be collected by a filter, and the mercury precipitated by zinc: copper precipitates mercury from the marine acid in a more imperfect manner.—If the ore under examination be very much entangled in the matrice, it muſt be mechanically freed from it by lotion; after which the ſoluble parts of the matrice being taken up by the nitrous, marine, or vitriolic acid, the metal itſelf is ſeparated by aqua-regia.

23 Mercury mineralized by vitriolic acid.

When mercury is mineralized by the vitriolic acid, it may be ſeparated by the help of the marine acid by trituration or digeſtion, and the metal precipitated by terra ponderoſa diſſolved in nitrous acid; after which the weight of the new earthy ſalt $a$ being given, we can eaſily learn the quantity of metal contained; yet, as ſolution of mercury in nitrous acid is not totally precipitated by Glauber's ſalt, we muſt not here depend on the weight of the precipitate. By another proceſs, therefore, our author obtained from 100 lb. of vitriol of mercury 33.899 of pure metal, and from an equal weight of corroſive ſublimate 75.5; from whence a calculation is eaſily deduced in the following manner. Let the quantity of vitriolic acid be $=0.15\,a$; the vitriol of mercury containing this, $=0.44a$; and the combination of mercury with marine acid, $=100-0.44\,a$. In the former ſalt the mercury conſtitutes $0.29\,a$, and in the latter $72.5=32\,a$; ſo that the whole metallic content in 100 lb. is $72.5-.03\,a$. The ſcarcity of this ore, however, renders it ſtill uncertain whether this combination of mercury with marine acid approaches to the nature of corroſive ſublimate or mercurius dulcis. In the latter caſe the calculation comes out different; for mercurius dulcis contains above 0.91 of metal, and the whole content is expreſſed by $91.18\,a+0.29a-0.40a=91.18-0.11a$.

*N. B.* The weights on which all theſe calculations are founded, may be found in Bergman's table of precipitates under the article Chemistry.

24 Lead,

5. *Ores of Lead.* This metal, if ever found native, may be eaſily examined as to its purity by means of nitrous acid, which diſcovers copper both by its blue colour and precipitation by iron; and ſilver is diſcovered by the addition of copper.

25 Mineralized by ſulphur;

When lead is mixed with ſulphur, and freed from any matrice, it is to be reduced to a fine powder, and then boiled in nitrous or marine acid until the ſulphur is obtained pure, which may be aſcertained by the cauſtic fixed alkali. The ſolution is then to be precipitated by mild mineral alkali, when the lead is either alone or mixed with ſilver. In the former caſe, if $a$ be the weight of the precipitate, that of the lead will be $\frac{100a}{32.}$ In the latter, the ſilver is to be extracted by volatile alkali, and the reſiduum multiplied by $\frac{100a}{132}$ will give the weight of the lead. The aerated ſilver is known by the diminution of weight; and if this be called $b$, then the ſilver in a metallic ſtate will be $\frac{100b}{129}$.

During this operation the ſolution in marine acid depoſits a large quantity of plumbum corneum, which is to be diſſolved in water before the precipitation. If antimony happens to be preſent, it is ſo much dephlogiſticated by the concentrated nitrous acid, that it is calcined and falls to the bottom: the given weight of this multiplied by $\frac{100}{138}$ ſhows the quantity of regulus diſſolved in marine acid, which falls ſpontaneouſly upon being dropped into water, and the plumbum corneum is taken up in its place.

Iron is ſeldom found in galena; however, in caſe it ſhould happen to exiſt, its preſence may be diſcovered in the following manner. Let the ſolution in marine acid be firſt ſo far ſaturated with fixed alkali, that the acid may predominate only a little, and yet all precipitation be carefully avoided. The lead will then be precipitated by a poliſhed plate of iron added during boiling; as will alſo the ſilver, which almoſt always exiſts in lead. The iron is then to be precipitated by aerated or phlogiſticated alkali, and its weight corrected by the part of the metallic plate which is diſſolved during precipitation.—When the ore contains any matrice, this is either ſoluble, and may at firſt be ſeparated by vinegar; or elſe is inſoluble in common acids, and is found collected at the bottom.

26 By fixed air;

When this metal is mineralized by fixed air, and deprived of all heterogeneous ſoluble mixtures, it may be diſſolved in nitrous acid, and precipitated by aerated mineral alkali; which being done, the quantity of lead is known by the weight of the precipitate as before. But if the matrice be ſoluble, we muſt employ the marine acid, and precipitate the metal by iron, as already directed.

27 By acid of phoſporus.

Lead has lately been found mineralized by acid of phoſphorus. An hundred pounds of this in powder is diſſolved in nitrous acid by means of heat, excepting a few martial particles which commonly remain at the bottom. On adding the vitriolic acid, the diſſolved lead falls in the form of a ſnow-white precipitate; which, when waſhed, collected, and dried, we may ſuppoſe to weigh $a$; in which caſe the correſponding lead $=\frac{100a}{143}$. The liquor remaining after precipitation yields, on being evaporated, a phoſphoric acid.

28 Copper,

6. *Ores of Copper.* This metal, when native, readily diſſolves in nitrous acid. Gold, when mixed with it, falls untouched to the bottom in form of a black powder. Silver is ſoon precipitated by copper; and iron, by boiling the ſolution for ſome time, and inſpiſſating to dryneſs, is gradually calcined and falls to the bottom.

29 Minera zed by ſ phur.

Copper mineralized by ſulphur is to be powdered, and gently boiled to dryneſs in five times its weight of concentrated vitriolic acid. The reſiduum muſt then be well waſhed with water, until all the metallic part has entered the menſtruum. The quantity of water uſed for the ſolution ought to be in ſome degree proportioned to the goodneſs of the ore; that which contains 0.05 of copper requires about 0.08 of water, and ſo on. A poliſhed plate of iron, about twice the weight of the copper, is then to be immerſed in the ſolution properly diluted, and the boiling continued until all precipitation ceaſes. If the quantity of water be too ſmall, the precipitated metal adheres very obſtinately to the ſurface of the iron plate; which, however, may always be freed by making uſe of a proper quantity of liquid. The precipitated copper, after being well waſhed, is to be ſpeedily dried; "but yet (ſays our author) with ſuch a degree of heat as to make the ſurface of the metal of different colours, which inſtantly and ſenſibly increaſes the weight."

30 To ſepa iron fro precipit ted cop.

Sometimes the precipitated copper is found mixed with iron, eſpecially in a poor ore; in which caſe the precipitate muſt be rediſſolved in order to obtain a richer ſolution; and this depoſits pure copper, if the operation has been properly conducted. A ſimilar circumſtance alſo takes place in the precipitation of ſilver by copper; a rich ſolution yielding the metal pure, but a poor one affording it mixed with copper. When the precipitated copper is alloyed with other metals, they may eaſily be ſeparated by ſolution in the nitrous acid. Gold, as has already been obſerved, remains at the bottom in form of a black powder, and ſilver is precipitated on a copper plate.

During this proceſs almoſt all the ſulphur is diſſipated by the intenſe heat neceſſary for evaporating the vitriolic acid to dryneſs: however, we may judge of its quantity from the ſum of the weights of the other ingredients, compared with that of the whole; or a ſolution in aqua-regia may be made on purpoſe for collecting the ſulphur.

31 Malach

The beautiful green ores of copper called *malachites*, in which the metal is mineralized by fixed air, are totally ſoluble in acids, and may be precipated by iron or aerated fixed alkali. In the latter caſe, ſuppoſing the weight of the precipitate to be $a$, that of the copper will be $\frac{100a}{194}$. Calcareous earth, when any happens to be preſent, may be thrown down by aerated alkali, and the metal precipitated by phlogiſticated alkali.—Blue calciform copper, in which the metal is alſo mineralized by aerial acid, is to be analyſed in the ſame way. Calciform red copper is alſo totally or in great part diſſolved with effervеſcence, though ſomewhat weaker than the other.

32 d quartz ords no pper by rgman's peri- nts.

Mr Bergman has examined by many different ways the red quartz of Mr Cronſtedt, ſuppoſed to contain a red calx of copper. None of this metal, however, was extracted either by volatile alkali, or boiling the vitriolic acid to dryneſs upon it. As the ſiliceous matrices, however, cannot eaſily be diſſolved by the common menſtrua, a quantity of mineral fluor was added to the vitriolic acid. The fluor acid has the property of diſſolving the particles of quartz, and ſetting at liberty thoſe of copper which might be entangled among them: but though this experiment always ſucceeds when copper is preſent, yet in this ſubſtance not the ſmalleſt ſign of metal could be diſcovered, and therefore it is probable that Mr Cronſtedt was miſtaken.

33

7. *Ores of Iron.* Though ſome traces of this metal are found almoſt every where in the mineral kingdom; yet the ores which contain it in conſiderable quantity, have it either mineralized by ſulphur or more or leſs calcined. Ores of iron are frequently found in Sweden ſo perfect that they obey the magnet, or are themſelves magnetic. Theſe attractive and magnetic ores, though they do not contain much ſulphur, are yet ſeldom entirely without it, though more can be extracted by menſtrua. Thoſe ſaturated with ſulphur are called *ſulphureous pyrites*, nothing but ſulphur being extracted from them; for though they ſometimes contain the metal in ſufficient quantity to pay the expence of ſmelting, it is always brittle and untractable in the fire, and is eaſily corroded by ruſt on expoſure to the open air.

All the ores of iron, when reduced to a very ſubtile powder, and repeatedly boiled in marine acid, part with their metal; the ſolution of the pyrites is accelerated by the addition of a ſmall quantity of nitrous acid. In order to obtain the metal by itſelf, we muſt precipitate it by phlogiſticated alkali; when, if we ſuppoſe the weight of the precipitate to be *a*, the correſponding quantity of metal will be $\frac{a}{6}$; but this muſt be corrected according to the quantity of the precipitant. That ore which is naturally ſoluble by vitriolic acid requires nothing but water to precipitate by means of phlogiſticated alkali.

34 anganeſe.

Manganeſe, which is frequently mixed with iron, may eaſily be diſcovered by immerſing the blue ſediment (carefully weighed) in water ſharpened by nitrous acid; by which means the part ariſing from the manganeſe is diſſolved. Other metals ſometimes enter the ore of iron in larger quantities; which for the moſt part render the former uſeleſs, by imparting bad qualities to the ſmelted iron.

35 native

8. *Ores of Tin.* The examination of native tin by the humid method is attended with no difficulty: for the addition of nitrous acid quickly deprives it ſo far of its phlogiſton, that it is reduced to the form of a white calx; the iron and copper, if any be preſent, remaining in the liquor. An hundred parts of tin corroded by nitrous acid, waſhed and dried, yielded 140 of calx. Arſenic may be ſeparated by waſhing with large quantities of warm water; for little enters the acid menſtruum. The other metals are but rarely united with native tin.

36 ure ore.

The pure ore, is commonly called, according to the magnitude of its cryſtals, *zinngrauſſen* or *zwitter*, by the Germans. Theſe forms cannot be examined in the moiſt way without great difficulty, as they are not acted upon effectually either by vitriolic, nitrous, or marine acid, or even by aqua-regia. The reaſon of this inſolubility is, that the calx, being well dephlogiſticated, is either not taken up at all, or in very ſmall quantity; and beſides, being involved in ſtrong particles, the menſtrua can ſcarce have acceſs to it. The following method is recommended by our author as one by which this proceſs may be nearly effected.

37 Chryſtalline ores of tin.

"To a very ſubtile powder of the cryſtalline tin ore obtained not only by levigation but elutriation, let there be added a quantity of concentrated vitriolic acid, and let this be expoſed to a ſtrong digeſting heat for ſeveral hours: then pour on a ſmall portion of concentrated marine acid; and upon agitating it, a vehement efferveſcence immediately begins, with a conſiderable heat ariſing from the marine acid, which is partly deprived of its water by the vitriolic, and generates a marine acid air. By this method the forces of the two are conjoined: water is to be added in about an hour after, and the clear liquor decanted after the ſediment has fallen. This operation is to be repeated with the reſiduum until the acids can diſſolve no more. What remains finally undiſſolved is nothing more than the ſtony matrice. Let the ſolution precipitated by means of aerated alkali $= a$, and the quantity of regulus will be $\frac{100a}{131}$. The ſubtile atoms of the cryſtalline ore, intimately mixed with any matrice, may, after due pulveriſation, be ſeparated by waſhing from a given portion, as the cryſtals are nearly of ſix times the ſpecific gravity of water; ſo that they not only exceed the gravity of the earthy particles, but that of the ores of other metals, and approach even to the lighter metals themſelves. The cryſtalline particles, after being ſeparated, are expoſed to the trial above deſcribed. The larger diſtinct cryſtals can ſeldom be employed; the moſt common ore contains particles of them very much diſperſed."

The adventitious metals uſually found in tin are copper and iron.

38 Biſmuth.

9. *Ores of Biſmuth.* This ſemimetal, when native, is eaſily taken up by nitrous acid, and may then be precipitated by water; after which any other metals that happen to be mixed with the biſmuth remain in the liquor, and may be ſeparated by the methods already frequently deſcribed. When mineralized by ſulphur, the ore is decompoſed by ſlight boiling in the ſame menſtrum; ſo that the ſulphur may be at laſt obtained; which when waſhed and collected is to be examined as to its purity and quantity. The ſolution of the metallic part precipitated by water leaves a white calx; and ſuppoſing its weight $= a$, that of the correſponding metal will be $\frac{100a}{113}$.

Iron is ſometimes met with in theſe ores, which may eaſily be diſcovered after the ſeparation of the biſmuth.

39 Mineralized.

Biſmuth in form of a calx, whether alone or mineralized by aerial acid, is alſo ſoluble in nitrous acid, and may be precipitated by water, upon which the heterogeneous matters remain in the liquor. The preſence of cobalt is diſcoverable by its communicating a red colour.

40 Nickel, 10. *Ores of Nickel.* This ſubſtance, when found native, may be diſſolved by the nitrous acid; and when precipitated by aerated alkali, yields a calx which almoſt always contains iron, arſenic, and cobalt, in the ſame proportions in which they uſually accompany the regulus obtained in the common way. If ſilver and biſmuth happen to be preſent, which, however, is very ſeldom the caſe, the former is be precipitated by common ſalt before the latter is employed. Sulphur may be ſeparated and collected during ſolution.

41 Mineralized. Nickel, mineralized by vitriolic acid, is ſcarcely ever without iron. A great part of the latter, however, is ſeparated by long and violent boiling in water. Aerated alkali throws down a greeniſh white precipitate; and if we ſuppoſe the weight of this $= a$, that of the reguline nickel is $= \frac{100a}{135}$. The ſame metal mineralized by aerial acid is diſſolved by ſpirit of nitre, and may be precipitated by means of mild alkali.

42 Arſenic, 11. *Ores of Arſenic.* The purity of native arſenic may be examined by diſſolving it in four times its weight of aqua-regia, and the ſolution ſlowly evaporated without any ſeparation of the metal. The arſenic is then to be precipitated by water, and collected upon a ſilter; the heterogeneous metals will be contained in the clear liquor which paſſes through the ſilter. If any ſilver be preſent, it falls to the bottom in conjunction with the marine acid. Iron is hardly ever abſent altogether, and is frequently in ſuch quantity, that the maſs has a poliſhed appearance, moſt commonly cryſtalline, and is commoly known by the name of *miſpickel*.

43 Mineralized by ſulphur. Arſenic mineralized by ſulphur is to be diſſolved in marine acid, with the addition of the nitrous occaſionally, in greater or leſſer quantities, ſo that the ſulphur may be ſeparated free from all metallic matter. The ſulphur collected, waſhed, and weighed, indicates the quantity of the arſenical part. This, however, ought to be precipitated ſeparately by water, and weighed; a ſtep which is always neceſſary where great accuracy is required. Arſenic diſſolved by marine acid may alſo be precipitated in its metallic form by zinc; the ſolution being previouſly weakened by ſpirit of wine. When ſulphur alone is united to the arſenic by its different proportions, it produces different colours, from a dilute yellow to an intenſe red. But if a conſiderable portion of iron alſo enters the compoſition, a white colour is generated, and a very different ſpecies of pyrites formed, which is called the *arſenical pyrites*. This may be analyzed by ſolution in marine acid in the manner already deſcribed.

44 Too much acid of nitre muſt not be uſed. In analyzing arſenical ores in general, we muſt take care not to add too much nitrous acid, as we would thus take away the whole of the phlogiſton, and diſengage the arſenical acid. The ſmalleſt quantity ſufficient for ſolution ought therefore to be employed; otherwiſe water will occaſion no precipitation: and even with all our caution, it is ſcarce poſſible to prevent a ſmall portion of the arſenical acid from being diſengaged, eſpecially if the boiling be long continued. This may be recovered by evaporating to dryneſs, though rarely alone, but united either with the alkaline earths or the metals which are preſent. Some of the arſenic eaſily flies off.

45 Cobalt, 12. *Ores of Cobalt.* This ſemimetal, when native, almoſt always contains iron, arſenic, and frequently nickel; whence no doubt it is, that ſome authors have ſaid that vitriolated cobalt is of a green colour, as well as the other ſalts containing this ſemimetal; but the truth is, that they are of an obſcure red, unleſs the nickel be in large quantity. To ſeparate theſe metals from one another, diſſolve the compound maſs in water, evaporate to dryneſs, and extract the cobalt with vinegar. Let the weight of the precipitate be *a*, and that of the correſponding regulus will be $\frac{100a}{160}$. If the arſenic be abundant in the evaporated ſolution, it may perhaps be precipitated by the effuſion of water. Cobalt united with ſulphur may be treated in the ſame way, as it differs from the native cobalt only in containing a ſmall quantity of ſulphur, which is to be ſeparated and collected.

46 Mineral zed by v triolic ac Cobalt has been diſcovered by Mr Brandt in a ſtate of union with vitriolic acid, along with a large quantity of iron, and without any arſenic. This may be examined by ſolution in aqua regia. The ſolution is yellow, with ſcarce any redneſs, on account of the great quantity of iron. By boiling it aſſumes an obſcure green, and reſumes its former colour; a property by which the exiſtence of cobalt is always known. The ore does not appear to contain any ſulphur; but a few drops of ſolution of terra ponderoſa diſſolved in marine acid immediately diſcovered the vitriolic acid. Scarce any veſtige of arſenic was to be met with. The vitriolic acid, however, though preſent in ſuch abundance, was yet ſo far dephlogiſticated, that it could not unite with the ſemimetal into a vitriolated cobalt, and therefore muſt be conſidered only as an impurity.

47 Trichite an ore o cobalt. The trichetes of the Greeks, which is found in the mines of Herngrund and Idua, adhering to an argillaceous ſtone, is found to contain a real cobalt, beſides the clay and vitriolic acid. It can only be precipitated by the phlogiſticated alkali.

48 A·ſenica cobalt. Cobalt frequently exhibits beautiful red efflorеſcences, ſometimes more dilute, and ſometimes of a deeper colour. Sometimes it appears like a looſe powder, ſometimes concrete, and at times forming moſt beautiful cryſtals radiating from a centre like a ſtar. Theſe ſubſtances always ſhow ſome veſtiges of arſenic; but as this ſubſtance is incapable, either in its reguline or calcined ſtate, of imparting a red colour to arſenic, it is reaſonable to ſuppoſe that it is done by the arſenical acid itſelf, as all acids have the property of communicating a red colour to cobalt. To determine this point, Mr Bergman made the following experiments. 1. Having artificially combined the acid of arſenic with cobalt, he found an exact reſemblance betwixt this compound and the natural cryſtals above mentioned. 2. On account of the ſcarcity of the latter ſubſtance, he extracted the pure acid of arſenic, firſt ſeparating it by vitriolic acid, and then abſorbing the latter by highly rectified ſpirit of wine, which takes up only the ſuperfluous acid, leaving the vitriolated cobalt untouched. Natural arſenicated cobalt is ſcarcely ſoluble in water, unleſs the latter be ſharpened by an acid; and when thus diſſolved it ſhould be precipitated by mild alkali, to diſcover the quantity of ſemimetal. Cobalt artificially combined with arſenical acid, and dried, ſhows the ſame properties with the natural.

The black calx of cobalt is generally found concreted

ted into an hard maſs, known by the name of the *glaſſy ore of cobalt*. This, when pulveriſed, may be diſſolved in the marine acid or aqua-regia, and examined like the former.

49 y ore balt.

50 13. *Ores of Zinc.* If ever this ſemimetal occurs in a native ſtate, its purity may be eaſily determined, as it is readily ſoluble in all the acids; and whatever heterogeneous metal is preſent may be precipitated by zinc.

51 e·ali- y ful and The pſeudo-galena which contains zinc mineralized by ſulphur, together with iron, muſt be carefully treated with nitrous acid, in order to extract the metallic part without decompoſing the ſulphur. If no other metal than iron be preſent, it may be precipitated by zinc; but if others alſo are combined with it, the iron muſt be calcined, by repeatedly abſtracting nitrous acid to dryneſs, and a new ſolution, made by vinegar or any other acid, examined.

52 te vi- l ana- l. To analyſe the combination of vitriolic acid and zinc, diſſolve the ſalt in water, and precipitate the ſolution with mild fixed alkali; when, if the weight of the precipitate be $a$, that of the regulus will be $\frac{100a}{193}$. When iron is preſent, as is uſually the caſe, it ought to be precipitated by a known weight of zinc.

53 c mine- ed by l air. This ſemimetal, mineralized by aerial acid, ought to be diſſolved in ſome of the mineral acids, and then precipitated by phlogiſticated alkali or mild fixed alkali. When the former is employed, the weight of the ſediment muſt be divided by 5, in order to aſcertain that of the metallic part.

54 imony, 14. *Ores of Antimony.* The purity of this ſemimetal, when found native, may be examined by reducing it to a calx with ſtrong nitrous acid: in which caſe, if it has been entirely pure, there will remain only a ſmall part diſſolved in the water, and which will ſeparate on the addition of water. When mineralized by ſulphur, the metallic part is taken up by aqua-regia, and the ſulphur remains pure. The ſolution, by boiling with ſtrong nitrous acid, lets fall a calcined antimony; which being ſeparated, the remaining liquor may be examined by phlogiſticated alkali or otherwiſe at pleaſure.

55 nbined 1 arſe- By the addition of a certain quantity of arſenic, crude antimony grows red, frequently exhibiting beautiful faſciculi of filaments radiating from a centre. The preſence of arſenic may be diſcovered by gently boiling the powder in aqua-regia, until the ſulphur be obtained pure. The arſenic and antimony are contained in the clear ſolution, and may be ſeparated in the following manner. Let concentrated nitrous acid be poured on, and the antimony reduced to a white calx by boiling. Let this be collected on a filter; and the liquor that paſſes through affords arſenic by evaporation, but generally deprived of phlogiſton, or reduced to the ſtate of arſenical acid. As the cauſtic alkali alſo takes up both ſulphur and antimony, it may be advantageouſly employed, eſpecially for the ſeparation of ſilver, or other metals which do not yield to this menſtruum. A hepar ſulphuris is indeed produced; but in this caſe it diſſolves little or nothing.

56 nganeſe 15. *Ores of Manganeſe.* This ſemimetal accompanies moſt of the ores of iron, though it has likewiſe ores of its own in which it predominates, but ſeldom to be met with. It has never been found native or mineralized by ſulphur, but commonly occurs in the form of a calx, generally alone and black, though ſometimes mineralized by the aerial acid. Theſe ores, after being reduced to a ſubtile powder, muſt be immerſed in any acid, particularly one of the mineral kind, together with a ſmall piece of ſugar, in order to ſupply the phlogiſton neceſſary for diſſolving the manganeſe. Freſh acid is to be poured repeatedly on the calx with ſugar, until no more can be extracted by a digeſting heat; after which the ſolution is to be precipitated by mild alkali: and if we ſuppoſe the weight of the ſediment $=a$, that of the correſponding regulus will be $\frac{100a}{180}$. The inſoluble reſiduum at bottom either contains heterogeneous mixtures or belongs to the matrice.

57 Combined with aerial acid. To ſeparate the iron from calx of manganeſe combined with aerial acid, nitrous acid is to be repeatedly abſtracted from the ore, and the heat, after each addition, increaſed to ignition; after which the manganeſe will be obtained pure, or at leaſt contaminated with iron in a much ſmaller degree than before. It may then be ſeparated by ſtrong concentrated vinegar or diluted nitrous acid. Manganeſe, when precipitated from ſuperabundant nitrous acid by phlogiſticated alkali, totally diſſolves in diſtilled water; which property affords likewiſe a method of ſeparating it perfectly from iron.

58 Method of eſſaying ſilver and gold. Beſides the foregoing kind of operations which relate only to the ores of metals, *eſſaying* is uſed in metallurgic operations to ſignify the method of determining how much gold or ſilver is contained in any maſs of metal already ſmelted from its ore.

1. *Eſſay of the Value of Silver*, to examine its purity, or the quantity of alloy mixed with it. The common method of examining the purity of ſilver, is by mixing it with a quantity of lead proportionable to the quantity of imperfect metals with which it is ſuppoſed to be alloyed; by teſting this mixture; and afterwards by weighing the remaining button of ſilver. The loſs of weight which the ſilver ſuffers by cupellation ſhows the quantity of imperfect metals which it contained.

We may hence perceive, that the eſſay of ſilver is nothing elſe than the refining of it by cupellation. The only difference between theſe two operations is, That when ſilver is teſted merely for the purpoſe of refining it, its value is generally known; and it is therefore mixed with the due proportion of lead, and teſted, without any neceſſity of attending to the loſs of weight it ſuſtains during the operation: whereas, in the eſſay, all poſſible methods ought to be employed to aſcertain preciſely this loſs of weight. The firſt of theſe operations, or the mere refining of ſilver, is made in the great, in the ſmelting of ſilver ores, and in mints for making money *. The ſecond operation is never made but in ſmall; becauſe the expences of ſmall operations are leſs than of great, and in the requiſite accuracy is more eaſily attended to. The laſt operation is our preſent object, and is to be performed in the following manner.

* See *Refining.*

We ſuppoſe, firſt, that the maſs or ingot of ſilver of which an eſſay is to be made, conſiſts of 12 parts perfectly equal; and theſe 12 parts are called *pennyweights*. Thus, if the ingot of ſilver be an ounce weight, each of theſe 12 parts will be $\frac{1}{12}$ of an ounce; or if it be a mark, each of theſe will be $\frac{1}{12}$ of a mark,

*Chem. Dict.*

mark, &c. Hence, if the maſs of ſilver be free from all alloy, it is called *ſilver of* 12 *penny-weights*; if it contains $\frac{1}{12}$ of its weight of alloy, it is called *ſilver of* 11 *penny-weights*; if $\frac{2}{12}$ of its weight be alloy, it is colled *ſilver of* 10 *penny-weights*; and theſe 10 penny-weights or parts of pure ſilver are called *fine penny-weights*.

We ought to obſerve here concerning theſe penny-weights, that eſſayers give alſo the name *penny-weight* to a weight equal to 24 real grains: which latter real penny-weight muſt not be confounded with the former, which is only ideal and proportional; and ſuch a confuſion is the more likely to take place, as this ideal penny-weight is alſo, like the former, divided into 24 ideal grains, which are called *fine grains*.

An ingot of fine ſilver, or ſilver of 12 penny-weights, contains then 288 fine grains; if this ingot contains $\frac{1}{288}$ part of alloy, it is ſaid to be *ſilver of* 11 *penny-weight and* 23 *grains*; if it contains $\frac{2}{288}$ of alloy, it is called *ſilver of* 11 *penny-weight and* 22 *grains*; if it contains $\frac{14}{288}$, it is called *ſilver of* 11 *penny-weight and* 10 *grains*; and ſo on. Laſtly, the fine grain has alſo its fractions, as $\frac{1}{2}$, $\frac{1}{4}$ of a grain, &c.

As eſſays to diſcover the value of ſilver are always made in ſmall, eſſayers only take a ſmall portion of an ingot for the trial; and the cuſtom in France is to take 36 real grains for this purpoſe, which is conſequently the largeſt weight they employ, and repreſents 12 fine penny-weights. This weight is ſubdivided into a ſufficient number of other ſmaller weights, which alſo repreſent fractions of fine penny-weights and grains. Thus 18 real grains, which is half of the quantity employed, repreſent ſix fine penny-weights; three real grains repreſent one fine penny-weight, or 24 fine grains; a real grain and a half repreſent 12 fine grains; and $\frac{1}{32}$ part of a real grain repreſents $\frac{1}{4}$ part of a fine grain, which is only $\frac{1}{752}$ part of a maſs of 12 penny-weights.

We may eaſily perceive, that weights ſo ſmall, and eſſay-balances, ought to be exceedingly accurate. Theſe balances are very ſmall, ſuſpended and incloſed in a box the ſides of which are panes of glaſs, that they may be preſerved from duſt, and that their motion may not be affected by agitated air, ſo as to diſorder their action *.

* See (Eſſay) *Balance*

When an eſſay of a maſs or ingot of ſilver is to be made, the cuſtom is to make a double eſſay. For this purpoſe, two fictitious ſemi-marks, each of which may be equal to 36 real grains, are to be cut from the ingot. Theſe two portions of ſilver ought to be weighed very exactly; and they ought alſo to have been taken from oppoſite ſides of the ingot.

Perſons accuſtomed to theſe operations know pretty nearly the value of ſilver merely by the look of the ingot, and ſtill better by rubbing it on a touchſtone. By the judgment they form of the purity of the ingot, they regulate the quantity of lead which is to be added to it, as this quantity muſt be always proportionable to the quantity of imperfect metal mixed with the ſilver.

Nevertheleſs, this proportion of lead to the alloy has not been preciſely determined. Authors who treat of this ſubject differ much. They who direct the largeſt quantity of lead ſay, that thereby the alloy is more certainly deſtroyed; and others who direct a ſmall quantity of lead, pretend, that no more of that metal ought to be uſed than is abſolutely neceſſary, becauſe it carries off with it always ſome portion of ſilver. Every eſſayer uſes his own particular method of proceeding, to which he is attached.

To aſcertain theſe doubtful points, three chemiſts of the Academy of Sciences at Paris, Meſſrs Hellot, Tillet, and Macquer, were appointed by the French government. They were directed to aſcertain every thing concerning the eſſay of gold and ſilver by authenticated experiments, made under the inſpection of a miniſter whoſe ſuperior knowledge is equal to his deſire of public good, and in preſence of the officers of the mint.

The experiments made by theſe chemiſts, and the conſequent regulation, have determined that four parts of lead are requiſite for one part of ſilver of 11 penny-weight and 12 grains, that ſix parts of lead are requiſite for ſilver of 11 penny-weight, eight parts of lead for ſilver of 10 penny-weight, 10 parts of lead for ſilver of nine penny-weight, and ſo on in the ſame progreſſion.

Two cupels of equal ſize and weight are to be choſen. The cuſtom is to uſe cupels of ſuch a ſize that their weight ſhall be equal to that of one half of the lead employed in the eſſay; becauſe ſuch cupels have been found capable of imbibing all the litharge formed during the operation. Theſe cupels are to be placed together under a muffle in an eſſay-furnace. The fire is to be kindled, and the cupels are to be made red-hot, and to be kept ſo during half an hour at leaſt before any metal be put into them. This precaution is neceſſary to dry and calcine them perfectly; becauſe if they contained any moiſture or inflammable matter, an ebullition and effervеſcence would be occaſioned in the eſſay. When the cupels are heated ſo as to become almoſt white, the lead is to be put into them; the fire is to be increaſed, which is done by opening the door of the aſh-hole ſo as to admit air, till the lead becomes red, ſmoking, and is agitated by a motion of its parts called its *circulation*, and till its ſurface becomes ſmooth and clear.

Then the ſilver, previouſly beat into ſmall plates for its eaſier fuſion, is to be put into the cupels; the fire is to be continued, and even increaſed, by putting hot coals at the mouth of the muffle, till the ſilver ſhall have *entered the lead*, that is, till it have melted and mixed with the lead. When the melted matter circulates well, the heat is to be diminiſhed by taking away, partly or entirely, the coals put at the mouth of the muffle, and by cloſing more or leſs the doors of the furnace.

The heat ought to be regulated ſo, that the eſſays in the cupels ſhall have ſurfaces ſenſibly convex, and ſhall appear ardent, while the cupels are leſs red; that the ſmoke ſhall riſe almoſt to the roof of the muffle; that undulations ſhall be made in all directions upon the ſurfaces of the eſſays, which are called *circulations*; that their middles ſhall be ſmooth, and ſurrounded with a ſmall circle of litharge, which is continually imbibed by the cupels.

The eſſays are to be kept in this ſtate till the operation is finiſhed, that is, till the lead and alloy have ſoaked into the cupel; and the ſurfaces of the buttons of ſilver being no longer covered with a pellicle of litharge, become ſuddenly bright and ſhining, and are then

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then ſaid to *lighten*. If the operation has been well conducted, the two eſſays ought to become bright nearly at the ſame time. When the ſilver has been by this operation well refined, we may ſee, immediately after it has brightened, the ſurface of the ſilver covered with rainbow colours, which quickly undulate and croſs each other, and then the buttons become fixed or ſolid.

The management of the fire is an important article in eſſays. For if the heat be too great, the lead is ſcorified and imbibed by the cupel ſo quickly, that it has not ſufficient time to ſcorify and carry along with it all the alloy; and if the heat be too little, the litharge is gathered upon the ſurface, and does not penetrate the cupel. The eſſayers ſay then, that the eſſay is *choaked* or *drowned*. In this caſe the eſſay does not advance; becauſe the litharge covering the ſurface of the metal defends it from the contact of air, which is abſolutely neceſſary for the calcination of metals.

We have above related the marks of a ſucceſsful eſſay. The heat may be known to be too great, from the convexity of the ſurface of the melted metal; from a too ſtrong circulation; from the too vivid appearance of the cupel, ſo that the colours given to it by the litharge cannot be diſtinguiſhed; and, laſtly, by the ſmoke riſing up to the roof of the muffle, or not being at all viſible from its being ſo ardent and red-hot as not to be diſtinguiſhable. In this caſe, the heat muſt be diminiſhed by ſhutting the door of the aſh-hole: Some eſſayers, for this purpoſe, put round the cupels ſmall, oblong, cold pieces of baked clay, which they call *inſtruments*.

If, on the contrary, the melted metal have a ſurface not very ſpherical, relatively to its extent; if the cupel appear dark-coloured, and the ſmoke of the eſſay do only creep upon the ſurface; if the circulation be too weak, and the ſcoria, which appears like bright drops, have but a dull motion, and be not ſoaked into the cupel; we may be aſſured that the heat is too weak; much more may we be aſſured of it when the metal *fixes*, as the eſſayers call it. In this caſe, the fire ought to be increaſed by opening the door of the aſh-hole, and by placing large burning coals at the mouth of the muffle, or even by laying them acroſs upon the cupels.

As ſoon as the lead is put into the cupels, the fire is to be increaſed, becauſe they are then cooled by the cold metal; and the lead ought to be quickly melted, to prevent its calx from collecting upon its ſurface in too great quantity before it be formed into litharge; which it would do, and be difficultly fuſed, if the heat were too weak.

When the ſilver is added to the lead, the heat muſt be ſtill increaſed; not only becauſe the ſilver cools the maſs, but becauſe it is leſs fuſible than lead. And as all theſe effects ought to be produced as quickly as poſſible, more heat is at length given than ought to be continued; and therefore, when the ſilver has entered the lead, the heat is to be diminiſhed till it becomes of a due intenſity for the operation.

During the operation, the heat ought gradually to be augmented to the end of it, both becauſe the metallic mixture becomes leſs fuſible as the quantity of lead diminiſhes; and alſo becauſe the lead is more difficultly ſcorifiable, as it is united with a larger proportion of ſilver. Hence the eſſays muſt be rendered very hot before they brighten.

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When the operation is finiſhed, the cupels are left in the ſame heat during ſome ſeconds, to give time to the laſt portions of litharge to be entirely abſorbed; becauſe, if any of it remained under the buttons of ſilver, it would ſtick to them. The fire is then allowed to extinguiſh, and the cupels to cool gradually, till the buttons have entirely fixed, particularly if they be pretty large; becauſe if they cool too quickly, their ſurfaces fix and contract before the internal maſs, which is thereby ſo ſtrongly compreſſed as to burſt through the external ſolid coat and form vegetations, or even to be entirely detached from the reſt of the maſs, and diſſipated. This is called *the vegetation of the button*. It ought to be carefully prevented, becauſe ſmall bits of ſilver are ſometimes thrown out of the cupel.

Laſtly, when the buttons are thoroughly fixed, they are to be diſengaged from the cupels by a ſmall iron utenſil while they are yet hot; otherwiſe they could not be diſengaged clean and free from part of the cupels, which ſtrongly adhere to them when the heat is much diminiſhed.

Nothing then remains to complete the eſſay, but to weigh the buttons. The diminution of weight which they have ſuſtained by cupellation will ſhow the purity or value of the ingot of ſilver.

We ought to obſerve, that as almoſt all lead naturally contains ſilver, and that after cupellation this ſilver is mixed with the ſilver of the ingot in the button of the eſſay; before we employ any lead in this operation, we ought to know how much ſilver it contains, that we may ſubtract this quantity from the weight of the button, when we compute the fineneſs of the ſilver of the ingot eſſayed. For this purpoſe eſſayers generally cupel a certain quantity of their lead ſeparately, and weigh accurately the button of ſilver it yields: or, at the ſame time when they eſſay ſilver, they put into a third cupel, in the muffle, a quantity of lead equal to that employed in both their eſſays; and when the operation is finiſhed, and the buttons are to be weighed, they throw the ſmall button produced from the lead alone into the ſcale which contains the weights; and as this exactly counterpoiſes the ſmall portion of ſilver which the eſſay buttons have received from the lead employed in the cupellation, the weights will ſhow preciſely the quantity of ſilver contained in the ingot, and thus the trouble of calculating is prevented. The ſmall button of ſilver procured from the cupellation of lead alone is called the *witneſs*. But to prevent this trouble, eſſayers generally employ lead which contains no ſilver, ſuch as that from Willach in Carinthia, which is therefore procured by eſſayers.

In the ſecond place, we ſhall obſerve, that a certain quantity of ſilver always paſſes into the cupel, as refiners in the great have long obſerved, and which happens alſo in eſſaying ſmall quantities. The quantity of ſilver thus abſorbed, varies according to the quantity of the lead employed, and the matter and form of the cupels; all which objects will undoubtedly be determined by the above mentioned chemiſts.

The cupellation which we have now deſcribed is exactly the ſame for eſſays by which the produce of a ſilver ore, or of an ore of another metal containing ſilver, is determined. But as theſe ores contain frequently gold, and ſometimes in conſiderable quantity, when theſe eſſays are made, the buttons of ſilver obtained

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by the eſſays ought to be ſubjected to the operation called *parting*. See Silver, Refining, &c.

M. Tillet has publiſhed a memoir, ſhowing that eſſays of ſilver made in the common method are uncertain and not to be depended upon; and that this uncertainty proceeds from the different quantities of ſilver abſorbed by the cupel in different eſſays, according as the heat and other circumſtances happened to vary. He therefore propoſes, in order to render eſſays accurate, to extract from the cupel the quantity of ſilver it has abſorbed during the operation, and to add this particle of ſilver to the button, as theſe two contain the whole quantity of ſilver in the matter eſſayed.

The variations in the different reſults of different eſſayers, or of the ſame eſſayer at different times, upon the ſame maſs of ſilver, are ſufficient proofs of the uncertainty mentioned by M. Tillet. Theſe variations are occaſioned, according to that author, principally from the following cauſes: 1. From the inaccuracy of the balances and weights employed. 2. From the faulty fuſion of the maſs to be eſſayed; by which means the contained alloy may be unequally diffuſed. 3. From the impurity of the lead, eſpecially from its containing ſilver, which is not always equally diffuſed through its maſs. 4. From the different proportions of lead uſed by different eſſayers. 5. From the difference of the intenſity of heat: for if the heat be not ſufficiently intenſe, the ſilver will ſtill contain a portion of alloy; and if the heat be too intenſe, too much of the ſilver will be imbibed by the cupel. 6. From the want of care in picking the ſmall particles of ſilver, which frequently adhere to the ſides of the cupel ſeparately, from the principal button. 7. From the ſpurting which ſometimes happens unobſerved by the eſſayer; and which may further falſify the eſſays of other pieces included under the ſame muffle, by the falling of the particles thrown out of one cupel into others adjacent. But, with all the attentions to avoid theſe cauſes of error, the author obtained different reſults from different eſſays of the ſame maſs of ſilver. Nor could he, by any method, make his different eſſays conſiſtent with each other, but by adding to each button the particle extracted from the cupel; and this method he found by accurate experiments to be perfectly exact.

M. Tillet obſerved, that the quantity of lead directed in the regulations eſtabliſhed in conſequence of the report made by Meſſrs Macquer, Hellot, and Tillet, is not ſufficient to purify the ſilver perfectly from its alloy. He nevertheleſs approves of the ſaid regulation; and conſiders the weight of the alloy retained by the button, as ſome compenſation for the weight of the ſilver abſorbed by the cupel. And as it is a conſtant fact, that the more lead is uſed, the greater is the loſs by the abſorption of the cupel, he remarks, that a regulation, directing a larger proportion of lead for France than is uſed in other countries, would be diſadvantageous to that kingdom; as thereby the ſilver of the ſame denomination would be required to be finer in that than in other countries where a leſs proportion of lead was employed. He obſerves, that the above mentioned rule, "that the more lead is uſed, the greater is the loſs by the abſorption of the cupel," does not extend to quantities of lead much above double the uſual quantities. Thus 32 parts of lead to one of ſilver, will not occaſion more abſorption than 16 parts of lead. For the refining ſcarcely takes place till the extraordinary quantity of lead be gone, and the ſilver is only or chiefly carried into the cupel along with the copper. Accordingly, he found, that he could render the ſilver finer by uſing four parts of lead at firſt, and afterwards adding two more parts when the iriſes began to appear, than by employing all the ſix parts of the lead at once. By this method of dividing the quantity of lead, the loſs of ſilver by abſorption was greater. M. Tillet did not find, that, by employing biſmuth alone, or mixed with lead, his eſſays were more certain than when lead alone was uſed. He obſerved, however, that the addition of biſmuth made the ſilver purer, but occaſioned a greater abſorption by the cupel.

Eſſay of Gold.

2. *Eſſay of the Value of Gold.* The fictitious weights uſed to determine the purity of gold, and to eſſay this metal, are different from thoſe of ſilver. See the preceding article. A maſs of gold perfectly pure, or which contains no alloy, is ideally divided into 24 parts, called *carats;* this pure gold is therefore called *gold of 24 carats.* If the maſs or ingot contains $\frac{1}{24}$th part of its weight of alloy, the gold is then of 23 carats; and if it contains $\frac{2}{24}$th or $\frac{1}{12}$th of alloy, it is gold of 22 carats, &c. Hence we ſee, that the carat of gold is only a relative and proportional weight, ſo that the real weight of the carat varies according to the total weight of the maſs of gold to be examined. If this maſs of gold weighs a mark, the real weight of the carat will be $\frac{1}{24}$th of eight ounces, which is equal to a mark. If the maſs weigh an ounce, the carat will be $\frac{1}{24}$th part of an ounce, or 24 grains. If it is only a penny-weight or 24 grains, the real weight of a carat will be one grain; and ſo on.

For greater accuracy, the carat of gold is divided into 32 parts, which are relative and proportional weights, as the carat itſelf is. Thus $\frac{1}{32}$d of a carat of gold is $\frac{1}{32}$d of $\frac{1}{24}$th, or the $\frac{1}{768}$th of any maſs of gold: and the gold which contains an alloy equal to the $\frac{1}{768}$th part of the whole maſs is called *gold of* 23 *carats, and* $\frac{31}{32}$; gold which contains $\frac{2}{768}$th of alloy is *gold of* 23 *carats and* $\frac{30}{32}$; and ſo on.

The real weight now generally uſed in the operation for determining the purity of gold is ſix grains. This weight then repreſents 24 carats. The half of this weight, or three real grains, repreſents 12 carats. According to this progreſſion, we ſhall find that $\frac{1}{4}$th of a real grain repreſents one carat, and the $\frac{1}{128}$th part of a grain repreſents the $\frac{1}{32}$d of a carat, or the $\frac{1}{768}$th part of a maſs of gold to be eſſayed.

As theſe weights are exceedingly ſmall, ſome eſſayers employ a weight of 12 grains, which muſt be very convenient.

When a maſs or ingot of gold is to be eſſayed, ſix grains are to be cut off, and exactly weighed: alſo 18 grains of fine ſilver are to be weighed. Theſe two metals are to be cupelled together with about ten times as much lead as the weight of the gold. This cupellation is conducted preciſely like that of the eſſay to determine the purity of the ſilver, excepting that the heat muſt be raiſed a little more towards the end of the operation when the eſſay is going to brighten. Then the gold is freed from all alloy but ſilver. If the quantity of copper or other alloy deſtructible by cupellation be required to be known, the remaining button is accurately weighed. The diminution of weight from the ſum

ſum of the weights of the gold and of the ſilver determines the quantity of this alloy.

The button containing gold and ſilver is then to be flattened upon a poliſhed piece of ſteel, and care muſt be taken to anneal it from time to time, to prevent its ſplitting and cracking. By this method it is reduced to a thin plate, which is to be rolled up, in order to be parted by aquafortis*. The diminution found after the parting from the original weight of the gold eſſayed, ſhows the whole quantity of alloy contained in that gold.

* See *Parting*.

The eſſay for determining the purity of gold is then made by two operations: the firſt, which is cupellation, deprives it of all its imperfect metals; and the ſecond, which is parting, ſeparates all the ſilver from it. By antimony alſo gold may be purified, which is a kind of dry parting. By this ſingle operation, all the imperfect metals, and ſilver with which gold is allayed, are ſeparated. See Purification, Gold, Silver, Refining.

*Essay-Hatch*, is the miners term for a little trench or hole, which they dig to ſearch for ſhoad or ore.

ESSEDARII, a ſort of gladiators, mentioned by Seneca, Suetonius, and Tully, who on ſome occaſions engaged one another out of chariots called *eſſeda*. The *eſſedum* was a ſort of heavy chariot from which the Gauls and Britons engaged the Romans. See Gladiator.

ESSENCE, in metaphyſics, that which conſtitutes the particular nature of each genus or kind, and diſtinguiſhes it from all others: being nothing but that abſtract idea to which this name is affixed, ſo that every thing contained in it is eſſential to that particular kind.

This Mr Locke calls the *nominal eſſence;* in contradiſtinction to the real eſſence, or conſtitution of ſubſtances on which this nominal eſſence depends. Thus the nominal eſſence of gold is that complex idea the word *gold* ſtands for; let it be, for inſtance, a body, yellow, weighty, malleable, fuſible, and fixed: but its real eſſence is the conſtitution of its inſenſible parts, on which theſe qualities and all its other properties depend, which is wholly unknown to us.

ESSENES, or Essenians, in Jewiſh antiquity, one of the three ancient ſects among that people. They allowed a future ſtate, but denied a reſurrection from the dead. Their way of life was very ſingular: they did not marry; but adopted the children of others, whom they bred up in the inſtitutions of their ſect: they deſpiſed riches, and had all things in common, and never changed their cloaths till they were entirely worn out. When initiated, they were ſtrictly bound not to communicate the myſteries of their ſect to others; and if any of their members were found guilty of enormous crimes, they were expelled.

Pliny tells us, that they dwelt on the weſt ſide of the lake of Aſphaltites; and that they were a ſolitary kind of men, living without women or money, and feeding upon the fruit of the palm-tree: he adds, that they were conſtantly recruited by new comers, whom the ſurges of ill fortune had made weary of the world; in which manner the ſect was kept up for ſeveral thouſands of years, without any being born among them. The reaſon why we find no mention made of them in the New Teſtament, may be their recluſe and retired way of life, not leſs than their great ſimplicity and honeſty, whereby they lay open to no cenſure or reproof.

ESSENTIAL, ſomething neceſſarily belonging to a thing, from which it cannot be conceived diſtinct: thus the primary qualities of bodies, as extenſion, figure, number, &c. are eſſential or inſeparable from them in all their changes and alterations.

*Essential Oils* are ſuch as are really contained in a plant, and are drawn from it by diſtillation in an alembic with water: they are thus called, in contradiſtinction to empyreumatic oils, which are raiſed by a naked fire without water.

ESSEX, a county of England, bounded on the north by the Stour, which ſeparates it from Suffolk and Cambridgeſhire; on the eaſt, by the German ſea; on the weſt, by Hertfordſhire and Middleſex; and on the ſouth by the river Thames. It extends 46 miles in length from E. to W. and about 42 in breadth from N. to S. and 200 in circuit. This county is in the dioceſe of London, and gives title of Earl to the family of Capel. It is divided into 19 hundreds, and contains 27 market-towns, 415 pariſhes, 125 vicarages, and 1100 villages, with about 34,800 houſes, and 208,800 inhabitants. It ſends eight members to parliament; namely, two for the county, and two for Colcheſter, Harwich, and Malden. The air in the inland parts is healthy; but in the marſhes near the ſea it produces agues, particularly in the part called the Hundreds. However, the fertility of the unwholeſome part is very great, and even the higher grounds of this county are very fruitful. About Saffron Walden, the earth, after bearing ſaffron three years, it is ſaid, will produce good barley for 18 years ſucceſſively without any manure. Its produce, which is very plentiful, conſiſts of corn, moſt excellent ſaffron, cattle, fowl, fiſh, and particularly oyſters. The chief manufactures of this county are cloth, ſtuffs, and particularly baize. The principal rivers, beſides the Thames, are the Stour, which falls into the German ſea at Harwich; the Lea, its weſtern boundary, falls into the Thames below Stratford; the Blackwater runs thro' the heart of the county, and paſſing by Chelmsford is joined by the Chalmer, and from thence runs into the German ſea; the Coln runs by Halſted to Colcheſter, and ſo into the ſea. The Roding which riſes northwards, near Dunmow, runs into the Thames near Barking. All theſe rivers abound in moſt ſorts of fiſh.

ESTATE, in law, ſignifies the title or intereſt that a perſon has in lands, tenements, or other effects; comprehending the whole in which a perſon hath any property, and will paſs the ſame.

Eſtates are either real or perſonal; otherwiſe diſtinguiſhed into freeholds, which deſcend to heirs; or chattels, that go to executors or adminiſtrators.

A fee-ſimple is the ampleſt eſtate our law admits of. See Fee.

Eſtates are obtained ſeveral ways; as, by deſcent from a father to a ſon; by conveyance or grant from one perſon to another; by gift or purchaſe; or by deed or will. See Descent, Succession, Tenure, &c.

Estates, in a political ſenſe, is uſed either to denote the dominions of ſome prince, or the general claſſes into which the people are divided.

In Britain, the eſtates are the king, lords, and commons;

mons; or rather the lords and commons, who meet the king in parliament, for reforming abuſes, and enacting good and wholeſome laws.

ESTHER, a canonical book of the Old Teſtament; containing the hiſtory of a Jewiſh virgin, dwelling with her uncle Mordecai at Shuſhan, in the reign of Ahaſuerus, one of the kings of Perſia.

The great beauty of this maid raiſed her to the throne of Perſia; whereby ſhe had an opportunity to ſave her countrymen, whoſe deſtruction was plotted by Haman, a favourite of that prince.

The learned are not agreed who this Ahaſuerus was. Archbiſhop Uſher ſuppoſes him to be Darius Hyſtaſpes, and Artyſtona to be Eſther. Scaliger makes him the ſame with Xerxes, and his queen Haneſtris to be Eſther. Joſephus, on the contrary, poſitively aſſerts, that the Ahaſuerus of the ſcriptures, is the Artaxerxes Longimanus of profane ſtory; and the Septuagint, throughout the whole book of Eſther, tranſlate Ahaſuerus by Artaxerxes. Moſt people ſubſcribe to this laſt opinion; and indeed the extraordinary kindneſs ſhowed by Artaxerxes to the Jews, can ſcarce be accounted for otherwiſe than by ſuppoſing that they had ſo powerful an advocate as Eſther to ſolicit for them.

ESTOILE'E, or Cross Estoille'e, in heraldry, a ſtar with only four long rays in form of a croſs; and, accordingly, broad in the centre, and terminating in ſharp points.

ESTONIA, is a province of the Ruſſian empire, and part of Livonia. It is bounded on the eaſt by the Baltic ſea, on the north by the Gulph of Finland, on the weſt by Ingria, and on the ſouth by Lettonia. It is divided into ſix diſtricts: 1. Harrien; 2. Wireland; 3. Aleutakin; 4. Wich; 5. Jerven; and, 6. Odepoa. The principal towns are, Revel, Weiſenberg, Borchholm, Narva, Nyſlot, Habſal, Derpt, St Elin, Pernau, and Roderſwick.

In former times the inhabitants of this country carried on a good trade in corn, which was dried in ſtoves: but wars have much depopulated the country, inſomuch that not a fourth part of it is inhabited, and a great number of gentlemens ſeats lie in ruins.

ESTOPPEL (formed of the French *eſtouper*, *oppilare*, *obſtipare*, "to ſtop, or block up"), in law, an impediment or bar of action, ariſing from a man's own act or deed; againſt which a man is forbidden, by law, to ſpeak, though it be to ſay the truth.

ESTOVERS, in law, is uſed, by Bracton, for that ſuſtenance which a man, committed for felony, is to have out of his lands or goods for himſelf and his family during impriſonment. In ſtat. 6 Edw. I. it is uſed for an allowance in meat or clothes. In ſome manors, the tenants have *common of Eſtovers;* that is, neceſſary botes or allowances out of the lord's wood: in which laſt ſenſe, eſtovers comprehends houſe-bote, hay-bote, and plow-bote; ſo that if a man have in his grant theſe general words, *de rationabili eſtoverio in boſcis*, &c. he may thereby claim all three.

Eſtovers is alſo uſed for alimony, which, if the huſband refuſes to pay, there is, beſides the ordinary proceſs of excommunication, a writ at common law, *de eſtoveriis habendis*, in order to recover it.

ESTRAY, or Stray, ſignifies any tame beaſt, as ſheep, oxen, ſwine, and horſes, or ſwans, found within a lordſhip, and not owned by any man; in which caſe being cried, according to law, in the church, and two market towns adjoining, if it be not claimed by the owner within a year and a day, it becomes the lord's of the ſoil where found. If the owner claims it within the year and day, he muſt pay the charges of finding, keeping, and proclaiming them; and he may ſeize it, without telling the marks or proving his property, which may be done at the trial if conteſted. If the beaſt ſtray within the year to another lordſhip, the firſt lord cannot retake it. An eſtray muſt be fed and kept, uninjured, and without labour, till it is reclaimed or the limited time expires.

ESTREAT, Extractum, in law, is uſed for the true copy or duplicate of ſome original writing, eſpecially of amercements or penalties ſet down in the rolls of a court, to be levied by the bailiff or other officer, on every offender.

ESTREMADURA, a province of Spain, has New Caſtile on the eaſt, Leon on the north, Andaluſia on the ſouth, and Portugal on the weſt. It is 175 miles in length, and 100 in breadth; and its principal towns are, Calatrava, Menda, and Badajoz, on the river Guadiana; Alcantara, on the Tajo; and Cona and Placentia, to the north of this river.

This province enjoys a very pure and healthful air, and its mountains are full of wild and tame animals; they having woods and foreſts for the one ſort, and paſtures for the other. The fields are planted with fruit-trees, which bear all kinds of delicious fruit. The vineyards produce excellent wines of all colours, and the fields yield plenty of corn.

Estremadura, a province of Portugal, near the mouth of the Tagus or Tajo, bounded on the north by Beira, on the eaſt and ſouth by Alentejo, and on the weſt by the Atlantic Ocean. It is about 88 miles in length, and 45 in breadth. This province is divided into ſix comarcas, viz. Litria, Liſbon, Tomar, Santaren, and Alanquar, to the north of the Tagus; and that of Setubal, to the ſouth of this river. Theſe are likewiſe the principal towns. Eſtremadura is equal, if not preferable, to any other province in Spain or Portugal. The diſtrict of Santaren produces ſuch plenty of corn, and feeds ſo many flocks of ſheep, that it may enter into competition with Sicily. The fruits and the wines are all excellent; and it was here that the ſweet oranges brought from China were firſt planted, and of which there are large quantities tranſported to foreign parts, with the wines and other fruits. The fields are covered with flowers almoſt all the year, from which the bees collect large quantities of fine honey. The olive-trees are numerous, from which they have excellent oil. The rivers abound with good fiſh, and the mountains have quarries of ſeveral kinds.

ETCHING, a method of engraving on copper, in which the lines or ſtrokes, inſtead of being cut with a tool or graver, are eaten in with aquafortis. See Engraving.

Etching is of a later invention, though not very modern, than engraving with the tool; of which it was at firſt only an imitation, that was practiſed by painters and other artiſts, who could much ſooner form their hands to, and attain a faculty of, working in this way, than with the graver. But being then nevertheleſs conſidered as a counterfeit kind of engraving, and therefore inferior to the other, it was culti-

vated

vated in a very confined manner; the cloſeneſs of the reſemblance of the work to that performed by the tool, being made the teſt of its merit, and conſequently the principal object of aim in thoſe who purſued it. This ſervile confinement of the art of etching to the imitation of the original kind of engraving, was a great cauſe of retarding its advancement towards perfection, as many of the moſt able maſters cramped their talents with the obſervance of it: which may be ſeen in the inſtances of Sadelers, Swaneberg, Villamena, and particularly Le Boſſe; who, in his treatiſe on engraving, has laid down as a principle, that the perfection of this kind conſiſts in the cloſe ſimilitude of the work with that done by the tool. This abſurd prepoſſeſſion has been ſince worn out: and the method of working with aquafortis has been ſo far improved, that inſtead of being now deemed a ſpurious kind of engraving, it evidently appears the foundation of an excellence in many modern works, that could never have been produced without it: ſince, though the neatneſs and uniformity of the hatches, which attend the uſe of the tool, is more advantageous with reſpect to portraits; yet the liberty and facility of the other manner give a much greater opportunity to exerciſe the force of genius and fancy in hiſtory-engraving; where the effect of the whole, and not the minute exactneſs in finiſhing all the parts, conſtitutes the principal value.

There are two methods practiſed of engraving in this way; the one with a hard varniſh or ground, the other with a ſoft. The firſt was formerly much uſed, being better accommodated to the intention of imitating the engraving with the tool; as the firmneſs of the body of the varniſh gave more opportunity of retouching the lines, or enlarging them with the oval-pointed needles, called by the French *echoppes*, as was practiſed by Le Boſſe and others for that purpoſe. The latter has now almoſt wholly ſuperſeded the uſe of the other, by the free manner of working it admits of; which affords a power of expreſſion incompatible with the greater inflexibility of the hard varniſh, that confines the lines and hatches to ſuch a regularity and ſameneſs, as gives a ſtiffneſs of manner and coldneſs of effect to the work.

The mixture of the uſe of the tool and aquafortis, which are now both employed in many caſes, has, however, given that perfection to engraving which it poſſeſſes at preſent. The truth and ſpirit of the outline that the method of working with aquafortis affords, and the variety of ſhades which the different kinds of black produce in this way, as well as other means of expreſſing the peculiar appearance and character of particular ſubjects, furniſh what was defective in the ſole uſe of the tool; while, on the other hand, the exactneſs and regularity of the lines, which are required for finiſhing many kinds of deſigns, are ſupplied by the graver; and by a judicious application of both, that complete finiſhing is obtained, which either of them alone muſt neceſſarily want.

The manner by which this art is performed, is the covering the ſurface of the plate with a proper varniſh or *ground*, as it is called, which is capable of reſiſting aquafortis; and then ſcoring or ſcratching away, by inſtruments reſembling needles, the parts of this varniſh or ground, in the places where the ſtrokes or hatches of the engraving are intended to be: then, the plate being covered with aquafortis, the parts that are laid naked and expoſed by removing the ground or varniſh, are corroded or eaten away by it; while the reſt, being ſecured and defended, remain untouched.

There are two methods of etching, as hath been already obſerved; the difference of which from each other conſiſts, as well in the difference of the varniſh or ground, as in that of the aquafortis, adapted to each kind; but the general methods of performing them are alike in both. Theſe varniſhes or grounds are diſtinguiſhed by the names of *hard* and *ſoft*: for in their conſiſtence, or the reſiſtance they give to the needles, lies their eſſential variation from each other. The hard varniſh, it is with good reaſon conjectured, was not the firſt in uſe: but ſoon took place of the other; and was, for ſome time, the moſt received in practice, on account of its admitting the work to be made more like that of the graver: the ſoft has, however, ſince, in its turn, prevailed to the excluſion of it in ſome degree, except in the caſe of particular ſubjects; but not ſo entirely as to take away the expedience of ſhowing how it is performed. The manner of etching with the ſoft varniſh is now, however, one of the moſt important objects of the art of engraving; and it is at preſent in univerſal uſe, ſometimes alone, but more frequently intermixed with the work of the tool, and in ſome caſes with great advantage, even where the whole is intended to paſs for being performed by the graver.

*Preparation of the ſoft varniſh; according to Mr Lawrence, an eminent Engliſh engraver at Paris.* "Take of virgin wax and aſphaltum, each two ounces; of black pitch and Burgundy pitch, each half an ounce. Melt the wax and pitch in a new earthen-ware glazed pot; and add to them, by degrees, the aſphaltum finely powdered. Let the whole boil till ſuch time as that, taking a drop upon a plate, it will break when it is cold, on bending it double two or three times betwixt the fingers. The varniſh being then enough boiled, muſt be taken off the fire; and letting it cool a little, muſt be poured into warm water, that it may work the more eaſily with the hands, ſo as to be formed into balls; which muſt be rolled up, and put into a piece of taffety for uſe."

It muſt be obſerved, firſt, that the fire be not too violent, for fear of burning the ingredients; a ſlight ſimmering will be ſufficient: ſecondly, that while the aſphaltum is putting in, and even after it is mixed with them, the ingredients ſhould be ſtirred continually with the ſpatula: and thirdly, that the water, into which this compoſition is thrown, ſhould be nearly of the ſame degree of warmth with it, to prevent a kind of cracking that happens when the water is too cold.

The varniſh ought always to be harder in ſummer than in winter; and it will become ſo if it be ſuffered to boil longer, or if a greater proportion of the aſphaltum or brown reſin be uſed. The experiment abovementioned, of the drop ſuffered to cool, will determine the degree of hardneſs or ſoftneſs that may be ſuitable to the ſeaſon when it is uſed.

*Preparation of the hard varniſh uſed by Callot, commonly called the* Florence varniſh. Take four ounces of fat oil very clear, and made of good linſeed oil, like that uſed by painters: heat it in a clean pot of glazed earthen-ware, and afterwards put to it four ounces of maſtich well powdered; and ſtir the mixture briſkly till the whole be well melted; then paſs the whole maſs through a piece of fine linen into a glaſs bottle with a long neck, that can be ſtopped very ſecurely; and keep it for the uſe that will be below explained.

*Method of applying the ſoft varniſh to the plate, and of blackening it.* The plate being well poliſhed and burniſhed, as alſo cleanſed from all greaſineſs by chalk or Spaniſh white, fix a hand-vice on the edge of the plate where no work is intended to be, to ſerve as a handle for managing it when warm: then put it upon a chafing-diſh, in which there is a moderate fire; obſerving to hold it ſo that it may not burn: keep the plate over the fire till it be ſo hot that the varniſh being brought into contact with it may melt: then cover the whole plate equally with a thin coat of the varniſh; and while the plate is warm, and the varniſh upon it in a fluid ſtate, beat every part of the varniſh gently with a ſmall ball or dauber made of cotton tied up in taffety; which operation ſmooths and diſtributes the varniſh equally over the plate.

When the plate is thus uniformly and thinly covered with the varniſh, it muſt be blackened by a piece of flambeau, or of a large candle which affords a copious ſmoke; ſometimes two, or even four, ſuch candles are uſed together for the ſake of diſpatch, that the varniſh may not grow cold: which if it does during the operation, the plate muſt then be heated again, that it may be in a melted ſtate when that operation is performed: but great care muſt be taken not to burn it; which, when it happens, may be eaſily perceived by the varniſh appearing burnt and loſing its gloſs. The following expedient is made uſe of for the more commodiouſly blackening the varniſh, being particularly neceſſary where the plates are large: Fix a ſtrong hook in the roof of the room, through which paſs four pieces of cord of equal length, at the end of which are fixed four iron rings of about four inches diameter, for ſupporting the corners of the plate. The plate being thus ſuſpended in the air, with the varniſhed ſide downwards, may be blackened with great convenience: but this is not, however, abſolutely requiſite, except in the caſe of large plates that could not, without difficulty, be held up, unleſs this or ſome other ſuch contrivance were made uſe of.

It is proper to be very cautious in keeping the flambeau or candle at a due diſtance from the plate, leſt the wick touch the varniſh, which would both ſully and mark it. If it appear that the ſmoke has not penetrated the varniſh, the plate muſt be again placed for ſome little time over the chafing-diſh; and it will be found, that, in proportion as the plate grows hot, the varniſh will melt and incorporate with the black which lay above it, in ſuch a manner that the whole will be equally pervaded by it.

Above all things, the greateſt caution ſhould be uſed in this operation, to keep all the time a moderate fire; and to move frequently the plate, and change the place of all the parts of it, that the varniſh may be alike melted every where, and kept from burning. Care muſt alſo be taken, that during this time, and even till the varniſh be entirely cold, no filth, ſparks, or duſt, fly on it; for they would then ſtick faſt, and ſpoil the work.

*Method of applying the hard varniſh.* This is preciſely the ſame as for the ſoft; being ſpread equally over the warm plate with the taffety-ball, and ſmoked in the ſame manner: only after it is ſmoked, it muſt be baked, or dried over a gentle fire of charcoal, till the ſmoke from the varniſh begins to decreaſe; taking care not to overheat the plate, which would both ſoften it and burn the varniſh.

The plate being thus prepared, and an exact drawing of the outlines of the deſign made upon thin paper, the other ſide of the paper muſt be well rubbed with chalk or Spaniſh whitening, or, which is better, with red chalk ſcraped to a powder; and the looſe chalk is cleared off with a linen rag: then the ſtained ſide of the paper is laid upon the varniſh, fixing the corners to the plate with wax or wafers, to prevent its ſhuffling; and with a blunted needle or pointer the drawing is ſlightly traced, and communicates to the varniſh an exact outline of the deſign to be etched.

A variety of pointers is neceſſary for the work. Thoſe uſed for the broad large ſtrokes ought to be very blunt, exceeding round, and well poliſhed at the point; the ſoal of a ſhoe anſwers very well for poliſhing the points. The fineſt ought to be as ſharp as a needle. If any ſcratches or falſe ſtrokes happen in the working, they are to be ſtopped up with a hair-pencil dipped in Venetian varniſh, mixed with lamp-black, by which means theſe places will be defended from the action of the aquafortis.

The next operation is that of eating or corroding the plate with aquafortis; in order to which, a border of ſoft wax (being a compoſition of bees-wax melted and tempered with a little Venice turpentine and tallow) muſt be faſtened round the plate about an inch high, in the form of a little wall or rampart, to contain the aquafortis. At one of the corners of this border a gutter is uſually made, which ſerves for pouring commodiouſly the aquafortis off the plate. The plate being thus bordered, take a due quantity of the refiners aquafortis; mix it with half its quantity of common water; and pour it gently on, till it riſe above a finger's breadth above the ſurface of the plate; when, if all things have been rightly conducted, it will be ſeen that the aquafortis will ſoon exert its action in the hatches which have been ſtrongly touched; but thoſe more weakly engraved will appear at firſt clear, and of the colour of the copper. The menſtruum muſt therefore be ſuffered to continue on the plate till its effects become viſible on the more tender parts: then the aquafortis ſhould be poured off, the plate waſhed with clean water, and dried before the fire: then take a ſmall pencil dipped into the Venetian varniſh, and cover with it the lighter parts of the plate. This being done, the aquafortis muſt again be poured on, and ſuffered to continue a longer or ſhorter time, according to the ſtrength of the menſtruum, or the nature of the engraving; when it muſt be again poured off as before, and the plate immediately waſhed with water.

It may not be improper to obſerve, that, when the aquafortis is on the plate, a feather ſhould be uſed to cleanſe away the foulneſs of the verdigris that gathers in the hatches when the aquafortis operates on them, and to give it more room to exert its action; for by moving the aquafortis to and fro on the plate by the feather, and bruſhing away the black ſaline matter where it appears to be formed, the hatches will be cleanſed,

cleanſed, and the aquafortis exert its whole force equally on every part.

The plate being thus ſufficiently corroded by the aquafortis, and well waſhed with water, it muſt be warmed at the fire, and the border of wax removed; after which, it muſt be made hotter till the varniſh melt; then it muſt be well wiped with a linen cloth, and afterwards rubbed heartily with oil of olives; when it will be ready to be retouched and finiſhed by the graver. See the article Engraving.

ETEOCLES (fab. hiſt.), a ſon of Œdipus and Jocaſta. After his father's death, it was agreed between him and his brother Polynices, that they ſhould both ſhare the royalty, and reign alternately each a year. Eteocles by right of ſeniority firſt aſcended the throne; but after the firſt year of his reign was expired he refuſed to give up the crown to his brother, acccording to their mutual agreement. Polynices, reſolved to puniſh ſuch an open violation of a ſolemn engagement, went to implore the aſſiſtance of Adraſtus king of Argos. He received that king's daughter in marriage, and was ſoon after aſſiſted with a ſtrong army headed by ſeven famous generals. Theſe hoſtile preparations were ſeen by Eteocles, who on his part did not remain inactive. He choſe ſeven brave chiefs to oppoſe the ſeven leaders of the Argives, and ſtationed them at the ſeven gates of the city. He placed himſelf againſt his brother Polynices, and he oppoſed Menalippus to Tydeus, Polyphontes to Capaneus, Megareus to Eteoclus, Hyperbius to Parthenopæus, and Laſthenes to Amphiaraus. Much blood was ſhed in light and unavailing ſkirmiſhes, and it was at laſt agreed between the two brothers that the war ſhould be decided by ſingle combat. They both fell in an engagement conducted with the moſt inveterate fury on either ſide; and it is even ſaid that the aſhes of theſe two brothers, who had been ſo inimical one to the other, ſeparated themſelves on the burning pile, as if ſenſible of reſentment, and hoſtile to reconciliation.

ETERNITY, an attribute of God, expreſſing his infinite or endleſs duration. See Logic and Metaphysics.

Eternity, in mythology, a divinity among the Romans, who had neither temples nor altars. They repreſented it under the figure of a woman, who held the ſun in one hand and the moon in the other: her ſymbols were a phœnix, globe, and elephant.

ETESIÆ, or Etesian *winds*, are ſuch as blow at ſtated times of the year, from what part ſoever of the compaſs they come. They are ſo called from the Greek word ἐτος, "year," being yearly or anniverſary winds, ſuch as our ſeamen call *monſoons* and *trade-winds*, which in ſome parts of the world continue conſtantly blowing for certain ſtated ſeaſons of the year. Thus, the north winds, which, during the dog-days, conſtantly blow upon the coaſts of Egypt, and hinder all ſhips from ſailing out of Alexandria for that ſeaſon, are called *eteſiæ* in Cæſar's Commentaries. In other authors, the weſt and eaſt winds are called *eteſiæ*, when they continue blowing for certain ſeaſons of the year.

Cellarius endeavours to prove that thoſe winds are properly eteſian which blow from that part of the horizon which is between the north and weſt about the time of the ſolſtice. In ancient writers, they are repreſented as of a very mild and gentle nature; and were called by mariners *ſomniculoſi* and *delicati*, from their ſleeping or ceaſing to blow in the night.

ETHELBALD,
ETHELBERT,
ETHELRED,
ETHELWOLF, kings of England. See (Hiſtory of) England.

ETHER,
ETHERIAL, See Æther.

ETHERIDGE (Sir George), a celebrated wit and comic genius in the reigns of Charles II. and James II. deſcended from an ancient family in Oxfordſhire, and born in 1636. He travelled in his youth; and, not being able to confine himſelf to the ſtudy of the law, devoted himſelf to the gayer accompliſhments. His firſt dramatic performance, the Comical Revenge, or Love in a Tub, appeared in 1664, and introduced him to the leading wits of the time: in 1668, he produced a comedy called She would if ſhe could; and, in 1676, he publiſhed his laſt comedy, called the Man of Mode, or Sir Fopling Flutter; which is perhaps the moſt elegant comedy, and contains more of the real manners of high life than any one the Engliſh ſtage was ever adorned with. This piece he dedicated to the beautiful ducheſs of York, in whoſe ſervice he then was; and who had ſo high a regard for him, that when, on the acceſſion of James II. ſhe came to be queen, ſhe procured his being ſent ambaſſador firſt to Hamburg, and afterwards to Ratiſbon, where he continued till after his majeſty quitted the kingdom. Our author being addicted to certain gay extravagances, had greatly impaired his fortune; to repair which, he paid his addreſſes to a rich widow: but ſhe, being an ambitious woman, had determined not to condeſcend to a marriage with any man who could not beſtow a title upon her; on which account he was obliged to purchaſe a knighthood. None of the writers have exactly fixed the period of Sir George's death, though all ſeem to place it not long after the Revolution. Some ſay, that on this event he followed his maſter king James into France, and died there; but the authors of the Biographia Britannica mention a report, that he came to an untimely death by an unlucky accident at Ratiſbon; for that after having treated ſome company with a liberal entertainment at his houſe there, where he had taken his glaſs too freely, and being, through his great complaiſance, too forward in waiting on his gueſts at their departure, fluſhed as he was, he tumbled down ſtairs and broke his neck, and ſo fell a martyr to mirth and jollity. As to Sir George's literary character, he certainly was born a poet, and ſeems to have been poſſeſſed of a genius whoſe vivacity needed no cultivation: for we have no proofs of his having been a ſcholar. His works, however, have not eſcaped cenſure on account of that licentiouſneſs which in general runs through them, which renders them dangerous to young unguarded minds; and the more ſo, for the lively and genuine wit with which it is gilded over, and which has therefore juſtly baniſhed them from the purity of the preſent ſtage.

ETHICS, the doctrine of manners, or the ſcience of moral philoſophy. The word is formed from ηθος, ηθη, *mores*, "manners;" by reaſon the ſcope or object thereof is to form the manners. See *Moral Philoſophy*.

ETHIOPIA, a celebrated, though very much un-

1
The name anciently beſtowed on different nations.

known empire of Africa, whoſe boundaries have never been exactly defined either by ancient or modern geographers. By ſome writers of antiquity the title of *Ethiopians* was given to all nations whoſe complexion was black: hence we find the Arabians as well as many other Aſiatics ſometimes falling under this denomination; beſides a number of Africans whoſe country lay at a diſtance from Ethiopia properly ſo called. Thus the Africans in general were by theſe writers divided into the weſtern or Heſperian Ethiopians, and thoſe above Egypt ſituated to the eaſt of the former; the latter being much more generally known than the former, by reaſon of the commerce they carried on with the Egyptians.

2
Different names of Ethiopia.

From this account we may eaſily underſtand why there ſhould be ſuch a ſeeming diſagreement among ancient authors concerning the ſituation of the empire of Ethiopia, and likewiſe why it ſhould paſs under ſuch a variety of names. Sometimes, for example, it was named *India*, and the inhabitants *Indians*; an appellation likewiſe applied to many other diſtant nations. It was alſo denominated *Atlantia* and *Etheria*, and in the moſt remote periods of antiquity *Cephenia*; but more uſually *Abaſene*, a word ſomewhat reſembling *Abaſſia* or *Abyſſinia*, two of its modern names. On the other hand, we find Perſia, Chaldæa, Aſſyria, &c. ſtyled *Ethiopia* by certain writers; and all the countries extending along the coaſts of the Red Sea were promiſcuouſly denominated *India* and *Ethiopia*. By the Jews the empire of Ethiopia was ſtyled *Cuſh* and *Ludim*.

3
Situation of Ethiopia Propria.

Notwithſtanding this diverſity of appellations, and vaſt diffuſion of territory aſcribed to the Ethiopians, there was one country to which the title was thought more properly to belong than to any of the reſt; and which was therefore called *Ethiopia Propria*. This was bounded on the north by Egypt, extending all the way to the leſſer cataract of the Nile, and an iſland named *Elephantine*; on the weſt it had Libya Interior; on the eaſt the Red Sea, and on the ſouth unknown parts of Africa; though theſe boundaries cannot be fixed with any kind of preciſion.

4
Different nations in Ethiopia.

In this country the ancients diſtinguiſhed a great variety of different nations, to whom they gave names either from ſome perſonal property, or from their manner of living. The principal of theſe were, 1. The *Blemmyes*, ſeated near the borders of Egypt; and who, probably from the ſhortneſs of their necks, were ſaid to have no heads, but eyes, mouths, &c. in their breaſts. Their form, ſomehow or other, muſt have been very extraordinary, as we learn from Vopiſcus, who gives an account of ſome of the captives of this nation brought to Rome. 2. The *Nobatæ*, inhabiting the banks of the Nile near the iſland Elephantine already mentioned, ſaid to have been removed thither by Oaſis to repreſs the incurſions of the Blemmyes. 3. The *Troglodytes*, by ſome writers ſaid to belong to Egypt, and deſcribed as little ſuperior to brutes. 4. The *Nubians*, of whom little more is known than their name. 5. The *Pigmies*, by ſome ſuppoſed to be a tribe of Troglodytes; but by the moſt approved writers placed on the African coaſt of the Red Sea. 6. The *Aualitæ* or *Abalitæ*, of which we know nothing more than that they were ſituated near the Abalitic gulf. 7. The *Struthiophagi*, ſo called from their feeding upon oſtriches, were ſituated to the ſouth of the Memnones. 8. The *Acridophagi*; 9. *Chelonophagi*; 10. *Ichthyophagi*; 11. *Cynamolgi*; 12. *Elephantophagi*; 13. *Rhizophagi*; 14. *Spermatophagi*; 15. *Hylophagi*; and, 16. *Ophiophagi*: all of whom had their names from the food they made uſe of, *viz.* locuſts, tortoiſes, fiſh, bitches milk, elephants; roots, fruits, or ſeeds, and ſerpents. 17. The *Hylogones*, neighbours to the Elephantophagi, and who were ſo ſavage that they had no houſes, nor any other places to ſleep in but the tops of trees. 18. The *Pamphagi*, who uſed almoſt every thing indiſcriminately for food. 19. The *Agriophagi*, who lived on the fleſh of wild beaſts. 20. The *Anthropophagi*, or man-eaters, are now ſuppoſed to have been the Caffres, and not any inhabitants of Proper Ethiopia. 21. The *Hippophagi*, or horſe-eaters, who lay to the northward of Libya Incognita. 22. The *Macrobii*, a powerful nation, remarkable for their longevity; ſome of them attaining the age of 120 years. 23. The *Sambri*, ſituated near the city of Tenupſis in Nubia upon the Nile; of whom it is reported that all the quadrupeds they had, not excepting even the elephants, were deſtitute of ears. 24. The *Aſachæ*, a people inhabiting the mountainous parts, and continually employed in hunting elephants. Beſides theſe, there were a number of other nations or tribes, of whom we ſcarce know any thing but the names; as the Gapachi, Ptoemphanes, Catadupi, Pechini, Catadræ, &c.

5
Of the ſettlem of Ethi

In a country inhabited by ſuch a variety of nations, all in a ſtate of extreme barbariſm, it is rather to be wondered that we have any hiſtory at all, than that it is not more diſtinct. It has already been obſerved, that the Jews, from the authority of the ſacred writers no doubt, beſtowed the name of *Cuſh* upon the empire of Ethiopia; and it is generally agreed that Cuſh was the great progenitor of the inhabitants. In ſome paſſages of ſcripture, however, it would ſeem that *Cuſh* was an appellation beſtowed upon the whole peninſula of Arabia, or at leaſt the greater part of it. In others, the word ſeems to denominate the country watered by the Araxes, the ſeat of the ancient Scythians or Cuthites; and ſometimes the country adjacent to Egypt on the coaſt of the Red Sea.

6
People riginal from A bia.

A number of authors are of opinion, that Ethiopia received its firſt inhabitants from the country lying to the eaſt of the Red Sea. According to them, the deſcendants of Cuſh, having ſettled in Arabia, gradually migrated to the ſouth-eaſtern extremity of that country; whence, by an eaſy paſſage acroſs the ſtraits of Babelmandel, they tranſported themſelves to the African ſide, and entered the country properly called *Ethiopia*: a migration which, according to Euſebius, took place during the reſidence of the Iſraelites in Egypt; but, in the opinion of Syncellus, after they had taken poſſeſſion of Canaan, and were governed by judges. Mr Bruce makes mention of a tradition among the Abyſſinians, which, they ſay, has exiſted among them from time immemorial, that very ſoon after the flood, Cuſh the grandſon of Noah, with his family, paſſed through Atbara, then without inhabitants, till they came to the ridge of mountains which ſeparates that country from the high lands of Abyſſinia. Here, ſtill terrified with the thoughts of the deluge, and apprehenſive of a return of the ſame calamity, they choſe to dwell in caves made in the ſides of theſe mountains, rather than truſt themſelves in the plains of Atbara;

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bara; and our author is of opinion, that the tropical rains, which they could not fail to meet with in their journey ſouthward, and which would appear like the return of the deluge, might induce them to take up their habitations in theſe high places. Be this as it will, he informs us that it is an undoubted fact, "that here the Cuſhites, with unparalleled induſtry, and with inſtruments utterly unknown to us, formed to themſelves commodious, yet wonderful, habitations in the heart of mountains of granite and marble, which remain entire in great numbers to this day, and promiſe to do ſo till the conſummation of all things."

9
cription
he city
Axum.

The Cuſhites having once eſtabliſhed themſelves among theſe mountains, continued to form habitations of the like kind in all the neighbouring ones; and thus following the different chains (for they never choſe to deſcend into the low country), ſpread the arts and ſciences, which they cultivated, quite acroſs the African continent from the eaſtern to the weſtern ocean. According to the tradition above-mentioned, they built the city of Axum early in the days of Abraham. This, though now an inconſiderable village, was anciently noted for its ſuperb ſtructures, of which ſome remains are ſtill viſible. Among theſe are ſome belonging to a magnificent temple, originally 110 feet in length, and having two wings on each ſide; a double porch; and an aſcent of 12 ſteps. Behind this ſtand ſeveral obeliſks of different ſizes, with the remains of ſeveral others which have been deſtroyed by the Turks. There is alſo a great ſquare ſtone with an inſcription, but ſo much effaced that nothing can be diſcovered excepting ſome Greek and Latin letters, and the word *Baſilius*. Mr Bruce mentions ſome "prodigious fragments of coloſſal ſtatues of the dog-ſtar" ſtill to be ſeen at this place: "and *Seir* (adds he), which, in the language of the Troglodytes, and in that of the low country of Meroe, exactly correſponding to it, ſignifies a *dog*, inſtructs us in the reaſon why this province was called *Sirè*, and the large river which bounds it *Siris*."

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al fly.

Soon after building the city of Axum, the Cuſhites founded that of Meroe, the capital of a large iſland or peninſula formed by the Nile, much mentioned by ancient hiſtorians, and where, according to Herodotus, they purſued the ſtudy of aſtronomy in very early ages with great ſucceſs. Mr Bruce gives two reaſons for their building this city in the low country after having built Axum in the mountainous part of Abyſſinia. 1. They had diſcovered ſome inconveniences in their caves both in *Sirè* and the country below it, ariſing from the tropical rains in which they were now involved, and which prevented them from making the celeſtial obſervations to which they were ſo much addicted. 2. It is probable that they built this city farther from the mountains than they could have wiſhed, in order to avoid the fly with which the ſouthern parts were infeſted. This animal, according to Mr Bruce, who has given a figure of it, is the moſt troubleſome to quadrupeds that can be imagined. He informs us, that it infeſts thoſe places within the tropical rains where the ſoil is black and loamy, and no other place whatever. It is named *Zimb* (by whom we are not informed), and has not been deſcribed by any other naturaliſt. It is of a ſize ſomewhat larger than a bee, thicker in proportion, and having broader wings, placed ſeparate like thoſe of a fly, and quite colourleſs, or without any ſpots. The head is large, with a ſharp upper jaw; at the end of which is a ſtrong pointed hair about a quarter of an inch long; and the lower jaw has two of theſe hairs: all of which together make a reſiſtance to the finger equal to that of a ſtrong hog's briſtle. One or all of theſe hairs are uſed as weapons of offence to the cattle; but what purpoſe they anſwer to the animal itſelf, our author does not ſay. So intolerable, however, are its attacks to the cattle, that they no ſooner hear its buzzing, than they forſake their food, and run about till they fall down with fright, fatigue, and hunger. Even the camel, though defended by a thick and ſtrong ſkin with long hair, cannot reſiſt the punctures of this inſect; which ſeem to be poiſonous, as they produce large putrid ſwellings on the body, head, and legs, which at laſt terminate in death. To avoid this dreadful enemy, the cattle muſt all be removed as quick as poſſible to the ſandy parts of Atbara, where they ſtay as long as the rains laſt, and where this dreadful enemy never ventures to follow them. The elephant and rhinoceros, who, on account of the quantity of food they require, cannot remove to theſe barren places, roll themſelves in the mud, which, when dry, coats them over ſo hard, that they are enabled to reſiſt the punctures of the inſect; though even on theſe ſome tubercles are generally to be met with, which our author attributes to this cauſe. Mr Bruce is of opinion, that this is the fly mentioned by Iſaiah, chap. vii. 18. 19. 'And it ſhall come to paſs, in that day, that the Lord ſhall *hiſs* for the fly that is in the uttermoſt part of the rivers of Egypt; and they ſhall come and ſhall reſt all of them in the deſolate valleys, and in the holes of the rocks, and upon all thorns, and upon all buſhes." 'That is (ſays Mr Bruce), they ſhall cut off from the cattle their uſual retreat to the deſert, by taking poſſeſſion of theſe places, and meeting them there, where ordinarily they never come, and which therefore are the refuge of the cattle.'

Meroe, which lay in N. Lat. 16°, the exact limit of the tropical rains, was without the bounds aſſigned by nature to theſe deſtructive inſects; and conſequently a place of refuge for the cattle. Mr Bruce, on his return through the deſert, ſaw at Gerri, in this latitude, ruins, ſuppoſed to be thoſe of Meroe, and caves in the mountains immediately above them; for he is of opinion, that they did not abandon their caverns immediately after they began to build cities. As a proof of this, he mentions that Thebes, in Upper Egypt, was built by a colony of Ethiopians; and that near the ruins of that city, a vaſt number of caves are to be ſeen even up to the top of a mountain in the neighbourhood; all of which are inhabited at this day. By degrees, however, they began to exchange theſe ſubterranean habitations for the cities they built above ground; and thus became farmers, artificers, &c. though originally their ſole employment had been commerce.

12
Of the magnificence of the ancient Indians and Egyptians.

On this ſubject Mr Bruce has given a very curious diſſertation; though how far the application of it to the Ethiopians may be juſt, we cannot pretend to determine. He begins with obſerving, that the magnificence of the Indians and Egyptians has been celebrated from the moſt remote antiquity, without any account of the ſources from whence all this wealth was derived: and indeed it muſt be owned, that in all hiſtories of theſe people, there is a ſtrange deficiency in this reſpect. The kings, we are to ſuppoſe, derived their ſplendor and magnificence from their ſubjects; but we are quite at a loſs to know whence their ſubjects had it: and this ſeems the more ſtrange, that in no period of their hiſtory are they ever repreſented in a poor or mean ſituation. Nor is this difficulty confined to theſe nations alone. Paleſtine, a country producing neither ſilver nor gold, is repreſented by the ſacred writers as abounding in the early ages with both thoſe metals in a much greater proportion than the moſt powerful European ſtates can boaſt of, notwithſtanding the vaſt ſupplies they derive from the lately diſcovered continent of America. The Aſſyrian empire, in the time of Semiramis, was ſo noted for its wealth, that M. Monteſquieu ſuppoſes it to have been obtained by the conqueſt of ſome more ancient and richer nation; the ſpoils of which enriched the Aſſyrians, as thoſe of the latter afterwards did the Medes. This, however, Mr Bruce very juſtly obſerves, will not remove the difficulty, becauſe we are equally at a loſs to know whence the wealth was derived to that former nation; and it is very unuſual to find an empire or kingdom of any extent enriched by conqueſt. The kingdom of Macedon, for inſtance, though Alexander the Great over-ran and plundered in a very ſhort time the richeſt empire in the world, could never vie with the wealth of Tyre and Sidon. Theſe laſt were commercial cities; and our author juſtly conſiders commerce as the only ſource from whence the wealth of a large kingdom ever was or could be derived. The riches of Semiramis, therefore, were accumulated by the Eaſt India trade centring for ſome time in her capital. While this was ſuffered to remain undiſturbed, the empire flouriſhed: but by an abſurd expedition againſt India itſelf, in order to become miſtreſs at once of all the wealth it contained, ſhe loſt that which ſhe really poſſeſſed; and her empire was ſoon after entirely ruined. To the ſame ſource he attributes the riches of the ancient Egyptians; and is of opinion, that Seſoſtris opened up to Egypt the commerce with India by ſea; though other authors ſpeak of that monarch in very different terms. As the luxuries of India have ſome how or other become the objects of deſire to every nation in the world, this eaſily accounts for the wealth for which Egypt has in all ages been ſo much celebrated, as well as for that with which other countries abounded; while they ſerved as a medium for tranſmitting theſe luxuries to other nations, and eſpecially for the riches of thoſe which naturally produced the Indian commodities ſo much ſought after. This was the caſe particularly with Arabia, ſome of the productions of which were very much coveted by the weſtern nations; and being, beſides, the medium of communication between the Eaſt Indies and weſtern nations, it is eaſy to ſee why the Arabian merchants ſoon became poſſeſſed of immenſe wealth.

Beſides the territories already mentioned, the Cuſhites had extended themſelves along the mountains which run parallel to the Red Sea on the African ſide; which country, according to Mr Bruce, has "in all times been called *Saba*, or *Azabo*, both which ſignify *South*;" an epithet given from its lying to the ſouthward of the Arabian gulf, and which in ancient times was one of the richeſt and moſt important countries in the world. "By that acquiſition (ſays our author), they enjoyed all the perfumes and aromatics in the eaſt; myrrh, and frankincenſe, and caſſia; all which grow ſpontaneouſly in that ſtripe of ground from the Bay of Bilur weſt of Azab to Cape Gardefan, and then ſouthward up in the Indian ocean, to near the coaſt of Melinda, where there is cinnamon, but of an inferior kind." As the Cuſhites or Troglodytes advanced ſtill farther ſouth, they met not only with mountains, in which they might excavate proper habitations, but likewiſe with great quantities of gold and ſilver furniſhed by the mines of Sofala, which, our author ſays, furniſhed "large quantities of both metals in their pure and unmixed ſtate, lying in globules without any alloy or any neceſſity of preparation or ſeparation." In other parts of his work, he labours to prove Sofala to have been the *Ophir* mentioned in ſcripture.

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Thus the Ethiopians, for ſome time after their ſettlement, according to Mr Bruce, muſt have been a nation of the firſt importance in the world. The northern colonies from Meroe to Thebes built cities, and made improvements in architecture; cultivated commerce, agriculture, and the arts; not forgetting the ſcience of aſtromomy, for which they had an excellent opportunity by reaſon of the clearneſs of the ſky in the Thebaid. Their brethren farther to the ſouth, or thoſe who inhabited Ethiopia properly ſo called, were confined for ſix months to their caves by reaſon of the tropical rains, whence they were naturally led to purſuits of another kind. "Letters *, at leaſt one kind of them, and arithmetical characters (we are told), were invented by this middle part of the Cuſhites; while trade and aſtronomy, the natural hiſtory of the winds and ſeaſons, were what neceſſarily employed that part of the colony eſtabliſhed at Sofala moſt to the ſouthward."

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While the Cuſhites were thus employed at home in collecting gold, gathering and preparing ſpices, &c. theſe commodities were ſent abroad into other countries by another ſet of people named *Shepherds*, who acted as carriers to them, and who afterwards proved ſo formidable to the Egyptians †. Theſe differed in their appearance from the Ethiopians, having long hair, and the features of Europeans; and were of a very dark complexion, though not at all like the blackmoors or negroes. They lived in the plain country in huts or moveable habitations, attending their cattle, and wandering up and down as various circumſtances required. By acting as carriers to the Cuſhites, they became a great and powerful people, poſſeſſing vaſt numbers of cattle, as well as a very conſiderable extent of territory. They poſſeſſed a ſtripe of land along the Indian ocean; and to the northward of that, another along the Red-Sea: but their principal habitation was the flat part of Africa between the northern tropic and the mountains of Abyſſinia, which country is now called *Beja*. This reaches from Maſuah along the ſea-coaſt to Suakem; then turns weſtward, and continues in that direction, having the Nile on the ſouth, the tropic of Cancer on the north, with the deſerts of Selima and Libya on the weſt. The next diſtrict belonging to theſe people was Meroe, now called *Atbara*, lying between the rivers Nile and Aſtaboras. A third diſtrict, now called *Derkin*, is a ſmall plain lying between the river Mareb on the eaſt and Atbara on the weſt But the moſt noble and warlike of all the Shepherds were thoſe who poſſeſſed the mountains

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* *Bruce Travels*, p. 383.

† See *E gypt*, n°

mountains of Habab, reaching from the neighbourhood of Maſuah to Suakem; which diſtrict is ſtill inhabited by them.

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Theſe Shepherds, according to our author, were diſtinguiſhed by ſeveral different appellations, which may be ſuppoſed to denote different degrees of rank among them. Thoſe called ſimply *Shepherds*, our author ſuppoſes to have been the common ſort who attended the flocks. Another ſet were called *Hycſos* or *Agſos*, ſignfying "armed ſhepherds," who are ſuppoſed to have been the ſoldiers. A third were named *Agag*, ſuppoſed to be the chiefs or nobles of theſe armed ſhepherds; whence the title of *king of kings*, according to Mr Bruce, is derived; and he ſuppoſes *Agag* killed by Samuel, to have been an Arabian ſhepherd.

16
aſon of enmity ween Shep- ds and yptians.

The building of Carthage augmented the power of the Shepherds to a conſiderable degree, by reaſon of the vaſt quantity of carriage naturally belonging to a place of ſuch extenſive commerce, and which fell into the hands of the Lehabim, Lubim, or Libyan peaſants. An immenſe multitude of camels, in the early ages, anſwered the purpoſe of navigation: and thus we find that commerce was carried on by the Iſhmaelites as early as the days of Joſeph from the ſouthern extremity of the Arabian peninſula. Theſe Shepherds, however, though generally the friends and allies of the Egyptians, who were alſo Cuſhites, ſometimes proved very bitter enemies to them, as is related in the hiſtory of that country. The reaſon of this may be deduced from the great oppoſition betwixt their manners and cuſtoms. The Egyptians worſhipped black cattle, which the Shepherds killed and uſed as food; the latter worſhipped the heavenly bodies, while the Egyptians were the groſſeſt idolaters, and worſhipped idols of all kinds that can be imagined. Hence a mere difference in religion might occaſion many bloody quarrels; though if the above account can be depended upon as authentic, it is natural to imagine that the mutual connection of intereſt ſhould have cemented their friendſhip, whatever difference there might happen to be in opinions of any kind.

17
igin of diffe- t Ethio- n na- ns.

Beſides the Cuſhites and Shepherds, however, we muſt now ſeek for the origin of thoſe different nations which have already been mentiond. Mr Bruce allows that there are various nations inhabiting this country, who are fairer than either the Cuſhites or the Shepherds, and which, though they have each a particular name, are all known by the general title of *Habeſh:* which may be tranſlated by the Latin word *convenæ*, ſignifying a number of diſtinct people meeting accidentally in one place; and which our author maintains againſt Scaliger, Ludolf, and a number of others, to be a very juſt tranſlation, and exceedingly conſonant to the hiſtory of the country.

18
ſt ſettle- nt of E- opia, ac- ding to Abyſ- lian hi- ry.

The moſt authentic ancient hiſtory of this country, according to Mr Bruce, is the chronicle of Axum: the character of which, among the modern Abyſſinians, ſtands next to the ſacred writings themſelves; and conſequently muſt be eſteemed the higheſt Abyſſinian authority we have on the ſubject. According to this book, there was an interval of 5500 years between the creation of the world and the birth of Chriſt; 1808 years before which laſt event the empire of Abyſſinia or Ethiopia received its firſt inhabitants. Two hundred years after its ſettlement, it was ſo deſtroyed by a flood that it received the name of *Ouré Midra*, or a country laid waſte; "or (ſays our author) as it is called in ſcripture itſelf, *a land which the waters or floods had ſpoiled*," (Iſaiah xviii. 2.) The peopling of the country was finiſhed about 1400 years before Chriſt, by the ſettlement of a great number of people, ſpeaking different languages, who ſat down peaceably in the high lands of Tigre, in the neighbourhood of the Shepherds, with whom they were in friendſhip. Theſe people, according to tradition, came from Paleſtine; and our author is inclined to believe the whole of the relation to be true, as the time coincides with the expulſion of the Canaanitiſh nations by Joſhua, which happened about 1490 B. C. ten years before which there had been, according to Pauſanias, a flood in Ethiopia which occaſioned prodigious devaſtation. Ethiopia, he thinks, would afford the moſt ready aſylum for the fugitive Canaanites, as they muſt have long had a commercial intercourſe with that country; and he ſupports the opinion likewiſe from what Procopius mentions of two pillars extant in his time, on the coaſt of Mauritania, with the following inſcription in the Phœnician language: "We are Canaanites, flying from the face of Joſhua, the ſon of Nun, the robber." The authenticity of theſe inſcriptions, however, is much diſputed, and therefore it cannot go a great way in eſtabliſhing any hiſtorical point. The firſt and moſt conſiderable of the colonies above mentioned ſettled in the province of Amhara; the ſecond in Damot, one of the ſouthern provinces; the third in another province called *Laſta*, or *Tcheratz-Agow*, from *Tchera* their principal habitation; and a fourth in the territory of Gafat.

19
The country laid waſte by a deluge.

20
Ethiopia conquered by Moſes.

Our author goes on to prove, that the Ethiopians in ancient times were not only the moſt learned people in the world, but that they ſpoke the original language, and were the inventors of writing. In what manner they came to degenerate from this character, and into their preſent ſtate of barbarity, cannot be known; this being a phenomenon equally unaccountable with the degeneracy of the Egyptians. According to ſome authors, the Ethiopians were conquered by Moſes: of which tranſaction we have the following account. Before the time of that legiſlator, the Ethiopians poſſeſſed the country of Thebais in Egypt: but, not content with this, they made an irruption into the Lower Egypt, and penetrated as far as Memphis; where, having defeated the Egyptians, they threatened the kingdom with total deſtruction. The Egyptians, by the advice of their oracles, put Moſes at the head of their forces; who immediately prepared for invading the enemy's country. The Ethiopians imagined that he would march along the banks of the Nile; but Moſes choſe rather to paſs through ſome of the interior countries, though greatly infeſted with ſerpents, and where conſequently his march muſt be attended with much danger. To preſerve his men, he conſtructed a number of cheſts or panniers of the Egyptian reed papyrus, which he filled with the birds named *Ibis*, celebrated for their antipathy to ſerpents. As ſoon as he approached the tract abounding with theſe reptiles, a ſufficient number of the birds were let out, who preſently cleared the way for the army by deſtroying the ſerpents. Thus the Ethiopians were ſurpriſed in their own country where they had dreaded no invaſion; their forces, being defeated in the field, were at laſt ſhut up in the capital Meroe, a city almoſt impregnable, by being ſurrounded with three rivers, the Nile, Aſtapus, and Aſtaboras. The daughter of the Ethiopian monarch, however, having an opportunity of ſeeing Moſes from the walls, fell in love with him, and offered to deliver up the city, provided he would ſwear to marry her. With this requiſition the Jewiſh legiſlator complied; but treated the inhabitants with great ſeverity, plundering the city, and putting many of the inhabitants to death. After this he ravaged the whole country, diſmantling all the places of ſtrength; and having thus rendered the Ethiopians incapable of attempting any thing againſt other nations for a conſiderable time, he returned in triumph to Egypt, after an abſence of ten years.

21 Of the queen of Sheba.

From the time of Moſes to that of Solomon there is a chaſm in the Ethiopic hiſtory. After this, however, we are furniſhed with ſome kind of regular accounts. The hiſtory commences with the queen of Sheba, who came to viſit the Jewiſh monarch, and whom the Abyſſinians ſuppoſe to have been ſovereign of Ethiopia Propria: but Mr Bruce is of opinion that ſhe was only ſovereign of that territory on the eaſtern coaſt of Africa named *Saba*, which he ſays ought to be her title inſtead of *Sheba*. In favour of this opinion he likewiſe urges, that it was cuſtomary for the Sabeans, or inhabitants of the African diſtrict named *Saba*, to be governed by women; whereas thoſe who inhabited the oppoſite ſide of the Arabian gulf, and who were named *Sabæan Arabs* or *Homerites*, were not only governed by kings, but would not allow their ſovereigns to go abroad any where under pain of being ſtoned to death. The Abyſſinians, as has been already hinted, claim her for their ſovereign; and he informs us, that having received an account from Tamerin, an Ethiopian merchant, of the ſurpriſing wiſdom and wealth of Solomon, ſhe undertook the journey mentioned in Scripture, to aſcertain the truth of the report. In this ſhe was attended by a great many of her nobility, carrying along with her alſo magnificent preſents for the monarch ſhe intended to viſit. According to the Abyſſinian hiſtorians, ſhe was a pagan at the time this journey was undertaken; but being ſtruck with admiration at the ſight of Solomon's grandeur, and the wiſdom he diſplayed, ſhe became a convert to the true religion. Another part of her hiſtory, by no means inconſiſtent with the character of Solomon, is, that ſhe returned in a ſtate of pregnancy; and within a year was delivered of a ſon, named *David* by Solomon; but by his mother *Menilek*, *Menelech*, or *Menelebeck*; that is, *another ſelf*. When he grew up, he was ſent to be educated at the court of his father Solomon; where having ſtaid ſome time, he was accompanied home by many doctors of the law, and other Iſraelites of diſtinction, particularly Azariah the ſon of Zadoc the high-prieſt. By theſe the Jewiſh religion was eſtabliſhed in Abyſſinia, where it continued till the introduction of Chriſtianity. The princeſs we ſpeak of is named *Makeda*, *Balkis*, or *Bulkis*, by the Abyſſinians. By our Saviour, and in the Ethiopic verſion of the Scriptures, ſhe is ſtyled *The Queen of the South*, and is ſaid to have come from the uttermoſt parts of the earth or of the habitable world. Hence the compilers of the Univerſal Hiſtory have inferred, that the princeſs ſtyled *The Queen of Sheba* in Scripture was really ſovereign of Ethiopia. "Ethiopia (ſay they) is more to the ſouth of Judæa than the territory or kingdom of Saba in Arabia Felix; conſequently has a better claim than that country for the dominions of the princeſs whom our Saviour calls *The Queen of the South*. Ethiopia is ſtyled *the remoteſt part of the habitable world* by Herodotus and Strabo; and therefore better agrees with what our Saviour has ſaid of the queen of Sheba, that ſhe came from 'the uttermoſt parts of the earth,' than Arabia. Nor can it be deemed a ſufficient reply to this argument, that Arabia Felix was the uttermoſt part of the earth in reſpect to Judæa, ſince it was bounded by the Red Sea: for that not only Egypt, but even Ethiopia, regions beyond that ſea, were known to, and had a communication with, the Jews, both before and in our Saviour's time, is indiſputably clear. Laſtly, from what has been ſuggeſted, it appears no improbable conjecture, that Judaiſm was not only known, at leaſt in a part of Ethiopia, but nearly related to the eſtabliſhed religion there, at the beginning of the apoſtolic age, if not much earlier. After all, theſe two opinions, ſo contrary in appearance, may be made conſiſtent without great difficulty; ſince it is agreed, that Arabia and Ethiopia have anciently borne the ſame name, been included during certain intervals in one empire, and governed by one prince. Part of the Arabs and Ethiopians had the ſame origin, and very conſiderable numbers of the Abaſeni tranſported themſelves from Arabia Felix into Ethiopia; a circumſtance which ſufficiently proves the intercourſe that formerly ſubſiſted between the Cuſhites or Ethiopians of Aſia and Africa."

The Abyſſinian hiſtorians farther inform us, that the young prince Menilek was anointed and crowned king in the temple of Jeruſalem, before he returned to his own country; that Azarias was conſtituted high-prieſt; that he brought with him an Hebrew tranſcript of the law; and though this book is now loſt, having been burnt along with the church at Axum, the office is ſtill continued in the line of Azarias, whoſe ſucceſſors are ſtyled *Nebrits*, *high-prieſts*, or *keepers of the church*, in that city; both church and ſtate being modelled exactly after that of Jeruſalem. Makeda continued to enjoy the ſovereignty for 40 years; and the laſt act of her reign was to ſettle the ſucceſſion to the throne. By this act the crown was declared hereditary in the family of Solomon for ever; it was alſo determined, that after her no woman ſhould be intitled to wear the crown or act as ſovereign of the country; but that the ſovereignty ſhould deſcend to the moſt diſtant heirs male, rather than to the females, however near; which two articles were to be conſidered as fundamental laws of the empire, not to be aboliſhed. Laſtly, that the male heirs of the royal family ſhould always be ſent priſoners to a high mountain, where they were to be confined till they ſhould be called to the throne, or as long as they lived This cuſtom, according to Mr Bruce, was peculiar to Abyſſinia; the neighbouring Shepherds being accuſtomed to have women for their ſovereigns, which prevailed in the laſt century, and perhaps does ſo at preſent.

Makeda having eſtabliſhed theſe laws in ſuch a manner as not to be revocable, died in the year 986 B. C. The tranſactions of her ſon Menilek after his acceſſion are not pointed out, farther than that he removed his capital to Tigré. His reign can by no means be accounted proſperous; ſince in his time the empire was invaded by Shiſhak or Seſac the king of Egypt, who plundered the temple of Jeruſalem under Rehoboam. The like fate attended a rich temple which had been built at Saba the capital of the Ethiopian empire, and which might very probably occaſion the removal of the imperial ſeat to Tigré, as already mentioned. It is indeed pretty plain from Scripture, that Ethiopia, or great part of it, was ſubject to this monarch; as the Ethiopians or Cuſhites mentioned in his army which invaded Judæa, are joined with the Lubims or Libyans, and muſt therefore be accounted inhabitants of Ethiopia Proper. This is indeed no ſmall confirmation of the opinion of Sir Iſaac Newton, who agrees with Joſephus in ſuppoſing Shiſhak to have been the celebrated Seſoſtris of profane hiſtorians. Thus far we are certain, that in the paſſage of Scripture juſt now alluded to, the ſacred hiſtorian indirectly aſcribes the ſovereignty of Ethiopia to Shiſhak; and we do not find it any where hinted that another Egyptian monarch was poſſeſſed of this ſovereignty. Herodotus alſo plainly tells us, that Seſoſtris was maſter of Ethiopia, and that no other Egyptian but himſelf ever poſſeſſed that empire.

22 thiopia nquered Shiſh. k

23 volu- ns after time of ſhak.

During the reign of Shiſhak we know no particulars concerning the Ethiopians; but after his death, Sir Iſaac Newton is of opinion that they defended Egypt againſt the Libyans, who had taken an opportunity of invading the country during the civil war which took place on the death of that great conqueror. In about ten years afterwards, however, according to the ſame author, they became aggreſſors; drowned the ſucceſſor of Shiſhak in the Nile, and ſeized on the whole kingdom; at which time Libya fell alſo into their hands. In the time of Aſa king of Judah, we find the combined hoſt of the Ethiopians and Lubims or Libyans making an attack on the territories of that prince, to the number of more than a million. This may be reckoned a conſiderable confirmation of the piece of hiſtory juſt mentioned; as it is not eaſy to conceive how the two ſhould combine in ſuch a manner, unleſs Zerah was maſter of both. The total overthrow which the allied army received from Aſa, gave the inhabitants of Lower Egypt an opportunity of revolting; who being ſuſtained by an army of 20,000 auxiliaries from Phœnicia and Paleſtine, obliged Memnon, ſuppoſed to be the ſame with Amenophis, to retire to Memphis. Soon after this he was forced to leave Egypt altogether, and to retire into Ethiopia; but in about 13 years he returned with his ſon Rameſſes at the head of a powerful army, and obliged the Canaanitiſh forces to retire out of the Lower Egypt; a tranſaction denominated by the Egyptian writers the *ſecond expulſion of the Shepherds.*

24 feat of rah by a king Judah.

25 Menes his ſuc- ors.

Sir Iſaac Newton is of opinion, that the Egyptian princes Menes, Memnon, and Amenophis, were the ſame perſon; and that by him Memphis was either originally built or firſt fortified, in order to prevent the Egyptians from entering Ethiopia. He is alſo ſuppoſed to have been the ſon of Zerah, and to have died in a very advanced age about 90 years after the deceaſe of Solomon. Thus, according to Sir Iſaac Newton's chronology, the moſt remarkable tranſactions of antiquity will be brought lower by ages than by the uſually received computations. According to this, the Argonautic expedition happened in the time of Amenophis; though ſome Greek writers inform us, that the ſame prince aſſiſted Priam king of Troy with a body of forces. He was ſucceeded by Rameſſes, already mentioned, who built the northern portico of the temple of Vulcan at Memphis. The next was Mœris; who adorned Memphis, and made it the capital of his empire, about two generations after the Trojan war. Cheops, Caphrenus, and Mycerinus, ſucceeded in order to Mœris; the laſt being ſucceeded by his ſiſter Nitocris. In the reign of Aſychis her ſucceſſor, both Ethiopia and Aſſyria revolted from Egypt; which, being now divided into ſeveral ſmall kingdoms, was quickly ſubdued by Sabacon or So, the emperor of Ethiopia. This monarch, ſoon after his acceſſion to the throne of Egypt, allied himſelf with Hoſhea king of Iſrael; by which means the latter was induced to revolt from the Aſſyrians; and in conſequence of this, an end was put to the kingdom of Iſrael by Shalmaneſer king of Aſſyria, in the 24th year of the era of Nabonaſſar, and 720th before the commencement of the Chriſtian era. According to Herodotus, this monarch voluntarily reſigned the crown of Egypt after he had enjoyed it 50 years; but Africanus relates, that after a reign of eight years, he died in Egypt, in the ninth year of Hezekiah king of Judah. His ſucceſſor Sethon, ſuppoſed to be the Sevechus of Manetho, advanced to Peluſium with a powerful army againſt Sennacherib king of Aſſyria; when the bowſtrings of the Aſſyrians were gnawed in pieces by a great number of rats or mice, and thus they were eaſily defeated with great ſlaughter by the Egyptians. Hence Herodotus informs us, that the ſtatue of Sethon which he ſaw in Egypt had a mouſe in its hand. Sir Iſaac Newton, however, explains the whole in an allegorical manner. As the mouſe among the Egyptians was a ſymbol of deſtruction, he conjectures, that the Aſſyrians were on this occaſion overthrown with great ſlaughter; and that Sethon, in conjunction with Terhakah, either king of the Arabian Cuſhites, or a relation of Sethon and his viceroy in Ethiopia Proper, ſurpriſed and defeated Sennacherib betwixt Libnah and Peluſium, making as great ſlaughter among his troops as if their ſhield-ſtraps and bowſtrings had been deſtroyed by mice.

26 Sennacherib defeated by Sethon.

27 Ethiopia ſubdued by Eſarhaddon.

In the 78th year of the era of Nabonaſſar, the empire of Ethiopia was ſubdued by Eſarhaddon king of Aſſyria; who held it three years, committing enormous cruelties both in that country and in Egypt. After his death the Ethiopians ſhook off the yoke, and maintained their independency till the time of Cyrus the Great the firſt king of Perſia; who, according to the Greek hiſtorian Xenophon, ſeems to have alſo been ſovereign of Ethiopia. After his death they revolted, and his ſon Cambyſes unſucceſsfully attempted to reduce them. Herodotus informs us, that before he undertook this expedition, he ſent ſome of the Ichthyophagi ambaſſadors to the king of the Macrobii or long-lived Ethiopians, under pretence of ſoliciting his friendſhip, but in reality to obſerve the ſtrength of the country. Of this the Ethiopian prince was aware, and told the ambaſſadors that he knew their deſign, reproached Cambyſes with his injuſtice and ambition, and gave them his bow; telling them at the ſame time, that the

28 Unſucceſsful expedition of Cambyſes againſt this country.

Perſians might think of invading Ethiopia when they could eaſily bend it; and in the mean time, that their maſter ought to thank the gods who had never inſpired the Ethiopians with a deſire of extending their territories by conqueſt. Cambyſes had ſent by the ambaſſadors a rich purple robe, gold bracelets, a box of precious ointment, a veſſel full of palm wine, and other things, which he imagined would be acceptable to the Ethiopian monarch. But all theſe, excepting the wine, were deſpiſed. This, he owned, was ſuperior to any liquor produced in Ethiopia; and he did not ſcruple to intimate, that the Perſians, ſhort-lived as they were, owed moſt of their days to the uſe of this excellent liquor. Being informed by the ambaſſadors, that a conſiderable part of the food made uſe of by the Perſians was bread, he ſaid that it was no wonder to find people who lived on *dung* unable to attain the longevity of the Macrobian Ethiopians. In ſhort, the whole of his anſwer was ſo contemptuous and diſguſting, that Cambyſes was filled with the greateſt indignation; in conſequence of which, he inſtantly began his march without taking time to make the neceſſary preparations, or even to procure proviſions of any kind for his army. Thus a famine enſued among them; which at laſt became ſo grievous, that the ſoldiers were obliged to eat one another: and Cambyſes himſelf, finding his life in great danger, was obliged to give orders for marching back again; which was not accompliſhed without the loſs of a great number of men. Another army which he ſent on an expedition againſt Ammonia, in order to deſtroy the celebrated oracle of Jupiter Ammon, periſhed entirely in the deſarts, being overwhelmed with the vaſt clouds of ſand frequently raiſed there by the wind.

29
Ethiopia at this time a powerful empire.

30
Ethiopia ſuppoſed by Sir Iſaac Newton to have been conquered by Cambyſes.

At this time, it is doubtful whether Cambyſes would have accompliſhed his purpoſe even if he had found it practicable to march into the heart of Ethiopia. This empire had but a ſhort time before received a very conſiderable acceſſion of ſtrength by the deſertion of 240,000 Egyptians who had been poſted by Pſammenitus in different places on the frontiers. Theſe not having been relieved for three years, had gone over at once to the emperor of Ethiopia, who placed them in a country diſaffected to him; ordering them to expel the inhabitants, and take poſſeſſion of their lands. Notwithſtanding this, however, Sir Iſaac Newton hints, that Cambyſes conquered Ethiopia about the 223d or 224th year of the era of Nabonaſſar; but his opinion in this reſpect does not appear to be well founded. We are told indeed, that the Perſian monarch, notwithſtanding the misfortunes he met with in the expedition above mentioned, did really make himſelf maſter of ſome of the Ethiopic provinces which bordered on Egypt; and that theſe, together with the Troglodytes, ſent him an annual preſent of two chænixes of unrefined gold, 200 bundles of ebony, five Ethiopian boys, and 20 elephants teeth of the largeſt ſize: but it appears improbable to the laſt degree, that even though Cambyſes had employed the whole of his reign in the attempt, he could have conquered the vaſt regions of Ethiopia Proper, Sennaar, and Abaſſia, which were all included in the Ethiopia of the ancients.

31
Ethiopians employed by Xerxes.

When Xerxes invaded Greece, we find his army, according to Herodotus, was partly compoſed of Ethiopians, of whom Herodotus mentions two diſtinct races of people. One of theſe inhabited the Aſiatic coaſt, and differed from the Indians only in their hair and language. Their arms were the ſame with thoſe of India; they wore helmets made of the ſkins of horſes, the ears and manes of which ſerved them for tufts and plumes of feathers; their ſhields being made of the ſkins of cranes. The hair of the Aſiatic Ethiopians was long, but that of the weſtern tribes was frizzled. The latter were alſo differently armed, having darts lighted at one end and covered with leather. We are not informed particularly from what nations theſe troops were brought, nor whether they were natural ſubjects of the king of Perſia or only auxiliaries: of conſequence we can conclude nothing certain concerning the dominion of the Perſian monarchs at this time over Ethiopia, farther than that they might poſſeſs ſome of the provinces next to Egypt; while the main body of the empire being in a ſtate of independence, and unconnected with other parts of the world, is not taken notice of by the hiſtorians of thoſe times.

32
Ethiopia conquered by Ptolemy Euergetes.

Though Alexander the Great had a deſire to know the ſources of the Nile, he did not ſuffer himſelf to be diverted by this curioſity from purſuing his grand expedition into Perſia. Ptolemy Euergetes, however, appears to have carried this curioſity to ſuch an extremity as to invade Ethiopia for no other purpoſe. It is ſurpriſing that the particulars of this expedition are not recorded by any hiſtorian, as it appears by an inſcription that he penetrated to the fartheſt parts of the empire, and conquered the moſt powerful nations in it. Of this we have the following account, which is looked upon by the beſt hiſtorians to be authentic. It was copied on the ſpot (being the weſtern entrance to Adule, one of the cities of Ethiopia) by Coſmas Egyptius, or, as ſome call him, Coſmas Indicopleuſtes, in the time of the emperor Juſtin I. by order of Eleſbaan king of the Axumites, and of which the following account is given by the perſon who copied it. "Here (ſays he), facing the road to Axuma, ſtood a chair of white marble, conſiſting of a ſquare baſe, a ſmall thin column at each angle of this baſe, with a larger wreathed one in the middle, a ſeat or throne upon theſe, a back and two ſides. Behind this chair there was a large ſtone three cubits high, which had ſuſtained conſiderable injury from time. This ſtone and chair contained an inſcription to the following purpoſe: 'Ptolemy Euergetes penetrated to the fartheſt parts of Ethiopia. He ſubdued Gaza, Agame, Signe, Ava, Tiamo or Tziamo, Gambela, Zingabene, Angabe, Tiama, Athagaos, Calaa, Semene, Laſine, Zaa, Gabala, Atalino, Bega, the Tangaitæ, Anine, Metine, Seſea, Rauſo, Solate, the territory of Rauſo, and ſeveral other kingdoms. Among the nations he reduced, were ſome inhabiting mountains always covered with a deep ſnow; and others ſeated upon ridges of hills, from whence iſſued boiling ſteams and craggy precipices, which therefore ſeemed inacceſſible. Having finally, after all theſe conqueſts, aſſembled his whole army at Adule, he ſacrificed to Mars, Neptune, and Jupiter; for his great ſucceſs, he dedicated this chair or throne to Mars.'

33
Conqueſt of Ethiopia by the Romans.

From the time of this conqueror to that of the emperor Auguſtus, we meet with nothing of any conſequence relating to Ethiopia Proper. The Roman forces having about this time been drawn out of Egypt

gypt in order to invade Arabia, Candace queen of Ethiopia, or perhaps rather of the iſland or peninſula of Meroe, took the opportunity of their abſence to make an irruption, with a numerous army, into the province of Thebais. As there was at that time no force to oppoſe her, ſhe met for ſome time with great ſucceſs; but hearing at laſt that Petronius, governor of Egypt, was in full march to attack her, ſhe retired into her own dominions. Petronius purſued her as far as Pſelcha, where with 10,000 men he gained an eaſy victory over 30,000 undiſciplined Ethiopian ſavages, armed only with poles, hatchets, and other clumſy or inſignificant weapons of a ſimilar nature. This victory was ſoon followed by the reduction of ſeveral fortreſſes; however, as the Roman ſoldiers were exceſſively incommoded by the heat of the climate, Petronius, notwithſtanding his ſucceſs, was obliged at laſt to retire. Soon after, Candace ſent ambaſſadors to Auguſtus himſelf with ſuch magnificent preſents, that the emperor is ſaid to have been thereby induced to grant her a peace on her own terms. From this time the Romans accounted themſelves maſters of Ethiopia: Auguſtus was complimented on the great glory he had acquired; and that he had, by reducing a country till that time unknown even to the Romans, finiſhed the conqueſt of Africa. No material alteration, however, took place in the affairs of Meroe in conſequence of this conqueſt, whether real or pretended. Pliny informs us that it had been governed by queens, who bore the title of Candace, for ſeveral generations before that time; and ſo it continued to be afterwards, as we learn from Scripture, where we are informed that, in the reign of Tiberius, the ſovereign of Ethiopia was ſtill named Candace. Some indeed are of opinion that the Candace mentioned in the Acts of the Apoſtles was the ſame with her who had been conquered by Auguſtus; but this ſeems by no means probable, as the interval of time is by far too long to be allowed for the reign of a ſingle princeſs.

34
ccount of
e Blem-
yes.

From an anecdote of the debauched emperor Heliogabalus, who was accuſtomed to confine his favourites, by way of diverſion, with old Ethiopian women, we may learn that ſome intercourſe took place between the two empires, and probably that the Ethiopians owned ſome kind of ſubjection to the Romans. The Blemmyes, a gang of monſtrous banditti, who inhabited the frontiers of Thebais, were vanquiſhed by the emperor Probus: but, towards the cloſe of the third century, we find them again become ſo powerful, that in conjunction with another nation called *Nobatæ*, who inhabited the banks of the Nile near the Upper Egypt, they committed ſuch depredations in the Roman territories, that Diocleſian was obliged to aſſign lands to the latter, and to pay both of them a conſiderable ſum annually, to deſiſt from their former practices. Theſe expedients did not anſwer the purpoſe; the ſavages continued their depredations till the time of the emperor Juſtinian, who treated them with more ſeverity, and obliged them to remain at peace. We are told by Procopius, that before the time of Diocleſian, the Roman territories extended ſo far into Ethiopia, that their boundaries were not 23 days journey from the capital, ſo that probably the whole empire had been in a ſtate of dependence on them.

35
Ethiopians converted to Chriſtianity by Frumentius.

From the time of this emperor to that of their converſion to Chriſtianity, we find nothing remarkable in the hiſtory of the Ethiopians. Three hundred and twenty-ſeven years are counted from the time of our Saviour to that of Abreha and Atzbeha, or from Abra and Aſba, who enjoyed the kingdom when the goſpel was preached in Ethiopia by Frumentius. This man was a kinſman and companion of a philoſopher named Meropius, a native of Tyre; who having travelled all over India, died on an iſland of the Red Sea. After his death Frumentius, with another named Ædeſius, who had alſo been his companion, were brought before the king of Ethiopia, to whom that iſland was ſubject. He took them into his ſervice; making the one his treaſurer and the other his butler. On the death of this prince, the queen conceived ſuch a favour for them, that ſhe refuſed to allow them to depart out of the kingdom; but committed the management of her affairs entirely to Frumentius, who made uſe of his influence to diffuſe the Chriſtian religion throughout the country, and at laſt was appointed biſhop of Axuma. It is ſaid, however, that the court and principal people, if not the nation in general, relapſed into idolatry, which continued to prevail till the year 521, when they were again converted by their king Adad, or Aidog.

36
The two kings refuſe to admit Arianiſm.

The two princes Abra and Aſba, who reigned jointly in Ethiopia in the time of Frumentius, lived in ſuch harmony together, that their friendſhip became almoſt proverbial. After being converted to Chriſtianity, they adhered ſtrictly to the orthodox doctrine, refuſing to admit an Arian biſhop into their country. In the time of the emperor Conſtantius, however, this hereſy was introduced, and greatly favoured by that monarch; and an attempt was made to depoſe Frumentius on account of his refuſal to embrace it.

37
Account of the war of the elephant.

The reign of theſe princes is remarkable for an expedition into Arabia Felix, called by the Mohammedan writers the war of the elephant, and which was undertaken on the following occaſion: The temple of Mecca, ſituated nearly in the middle of the Arabian peninſula, had been held in the greateſt veneration for near 1400 years; probably from the notion entertained by the people in the neighbourhood, that Adam pitched his tent on that ſpot. Here alſo was a black ſtone ſuppoſed to poſſeſs extraordinary ſanctity, as being that on which Jacob laid his head when he had the viſion of angels. The moſt probable account of the real origin of this temple, according to Mr Bruce, is, that it was built by Seſoſtris, and that he himſelf was worſhipped there under the name of Oſiris.

On account of the veneration in which this tower and idol were held by the Arabians, Mr Bruce ſuppoſes that the thought was firſt ſuggeſted of making it the emporium of the trade between India and Africa; but Abra, in order to divert it into another channel, built a very large temple near the Indian ocean in the country of the Homerites; and, to encourage the reſort of people to this new temple, he beſtowed upon it all the privileges of the former which ſtood in the city of Mecca. The tribe of Arabians named *Koreiſh*, in whoſe country Mecca ſtood, being exceedingly alarmed at the thoughts of having their temple deſerted, entered the new one in the night, burned all that could be conſumed, and beſmeared the remains with human excrements. Abra, provoked at this ſacrilege, 38 Miraculous deſtruction of the Ethiopian army.

crilege, aſſembled a conſiderable army, with which he inveſted Mecca, himſelf appearing on a white elephant, from whence the war took its name already mentioned. The termination of the war, according to the Arabian hiſtorians, was miraculous. A vaſt number of birds named *Ababil* came from the ſea, having faces like lions; each carrying in its claws a ſmall ſtone about the ſize of a pea, which they let fall upon the Ethiopian army in ſuch numbers, that every one of them was deſtroyed. At this time it is ſaid that the ſmall-pox firſt made its appearance; and the more probable account of the deſtruction of the Ethiopian army is, that they periſhed by this diſtemper.

39 Firſt appearance of the ſmall-pox.

40 Reconverſion to Chriſtianity under Eleſbaan.

41 Chriſtians perſecuted in Arabia.

The war of the elephant is ſuppoſed to have terminated in the manner above-mentioned about the year 360; from which time to that of Eleſbaan, named alſo *Caleb*, and probably the ſame with the Adad or Adag already mentioned, we meet with nothing remarkable in the Ethiopic hiſtory. He engaged in a war with the Homerites or Sabæans in Arabia Felix; whom he overthrew in battle, and put an end to their kingdom; after which he embraced the Chriſtian religion in token of gratitude for the ſucceſs he had met with In the time of this prince a violent perſecution of the Chriſtians took place in Arabia. The Jewiſh religion had now ſpread itſelf far into that peninſula; and in many places the profeſſors of it were become abſolute maſters of the country, inſomuch that ſeveral Jewiſh principalities had been erected, the ſovereigns of which commenced a ſevere perſecution againſt the Chriſtians. Among the reſt, one Phineas diſtinguiſhed himſelf by his cruelty, having prepared a great number of furnaces or pits filled with fire, into which he threw thoſe who refuſed to renounce Chriſtianity. The Chriſtians applied for relief to the emperor Juſtin; but he being at that time engaged in a war with the Perſians, could not interfere: however, in the year 522, he ſent an embaſſy to Eleſbaan, who was now alſo a member of the Greek church, intreating him to exert himſelf for the relief of the Chriſtians of Arabia. On this the emperor commanded his general Abreha, governor of the Arabian province Yemen, to march to the aſſiſtance of Aretas, ſon to a prince of the ſame name whom Phineas had burnt; while he himſelf prepared to follow with a more conſiderable force. But before the arrival of the Ethiopian monarch, young Aretas had marched againſt Phineas, and entirely defeated him. In a ſhort time afterwards the emperor himſelf arrived, and gave Phineas a ſecond defeat: but notwithſtanding theſe misfortunes, it does not appear that either the principality of Phineas or any of the other Jewiſh ones, was at this time overturned; though it ſeems to be certain, that at the time we ſpeak of, the Ethiopians poſſeſſed part of the Arabian peninſula. According to the Arabian hiſtorians, the war of the elephant, with the miraculous deſtruction of the Ethiopian army already mentioned, took place in the reign of Eleſbaan.

42 Cruelty of Phineas a Jewiſh prince.

43 He is defeated.

Some hiſtorians mention, that the Ethiopian monarchs embraced the doctrines of Mahomet ſoon after the impoſtor made his appearance; but this ſeems not to be well founded: though it is certain that the *Najaſhi* or Ethiopian governor of Yemen embraced Mahommedaniſm, and that he was related to the royal family. On this occaſion, however, the Ethiopians loſt all the footing they once had in Arabia; the governors being expelled by Mohammed and his ſucceſſors. They fled to the African ſide of the Red Sea with numbers of their ſubjects, where they erected ſeveral ſmall kingdoms, as Adel, Wypo, Hadea, Mara, and others which ſtill continue.

44 Ethiopians driven out of Arabia.

45 Number of Jews in Ethiopia increaſed.

During the conqueſts of the caliphs, the Jews were for ſome time every where driven out of their dominions, or oppreſſed to ſuch a degree that they voluntarily left them. Ethiopia offered them an aſylum: and in this country they became ſo powerful, that a revolution in favour of Judaiſm ſeemed ready to take place. One family had always preſerved an independent ſovereignty on a mountain called Samen, the royal reſidence being on the top of an high rock; and ſeveral other high and rugged mountains were uſed by that people as natural fortreſſes. Becoming by degrees more and more powerful, Judith the daughter of one of their kings formed a deſign of overturning the Ethiopian government, and ſetting aſide the family of Solomon, who had hitherto continued to enjoy the ſovereignty. This deſign was facilitated by ſeveral circumſtances. The empire had been weakened by an unſucceſful war, famine, and plague; the throne was poſſeſſed by an infant; and the abſurd cuſtom of confining the whole royal family on a rock named *Damo*, gave her an opportunity of cutting them all off at once by ſurpriſing that place. Fortunately, however, the king himſelf eſcaped the general cataſtrophe, and was conveyed by ſome of the nobility of Amhara to the province of Xoa or Shoa; by which means the line of Solomon was preſerved, and afterwards reſtored, though not till after a very conſiderable interval.

46 Royal family of Ethiopia maſſacred by Judith.

47 The king eſcapes.

48 Judith uſurps the throne.

Judith having by this maſſacre eſtabliſhed her own power, aſſumed the imperial dignity, though in direct oppoſition to an eſtabliſhed and fundamental law of the empire already mentioned, that no woman ſhould enjoy the ſovereign power. The people, however, ſeemed to have ſubmitted quietly to her government, as ſhe ſat on the throne for 40 years, and afterwards tranſmitted the ſovereignty to her poſterity; five of whom reigned ſucceſſively in this country. We are not furniſhed with any particulars concerning their reigns; farther than that, during them, the people were greatly oppreſſed. By ſome means, of which hiſtorians have not given any account, another revolution took place, and a new ſet of uſurpers, related to the family of Judith, but not their direct lineal deſcendants, ſucceeded to the throne. Theſe were Chriſtians, and governed with much greater lenity than the Jewiſh ſovereigns had done; but ſtill, being uſurpers, none of their tranſactions are recorded in the Abyſſinian annals, excepting thoſe of Lalibala, who was accounted a ſaint. He lived in the end of the 12th or beginning of the 13th century, and proved a great prince. At that time the Chriſtians in Egypt were grievouſly perſecuted by the Saracens, who had a particular abhorrence at maſons, builders, and ſtone-cutters; looking upon them as the chief promoters of idolatry by the ornaments they put upon their works. Theſe were joyfully received by Lalibala; who, by affording them an aſylum in his dominions, ſoon collected a great number. They were employed by him in hewing churches out of the ſolid rock, after the example of the ancient Troglodytic habitations; and many works of this kind

49 A new revolution takes place.

50 Chriſtians perſecuted in Egypt fly to Ethiopia.

51 libala lertakes liminiſh ſtream he Nile.

kind remain in the country to this day. He undertook, however, a ſtill more difficult and arduous taſk; no leſs than that of leſſening the ſtream of the Nile, and thus ſtarving the whole kingdom of Egypt now in the hands of his enemies, and who perſecuted thoſe of his religion. From the account given by Mr Bruce of this project, it appears that there really is a poſſibility in nature of accompliſhing it; not indeed by turning the courſe of the Nile itſelf, but by diverting that of many of its branches, which are the means of conveying into it the water ſupplied by the tropical rains, and by which it overflows its bank annually. We are likewiſe aſſured by the ſame author, that Lalibala ſucceeded in his enterprize ſo far as to divert the courſe of two large rivers from the Nile, and that they have ever ſince flowed into the Indian-ocean. He next proceeded to carry a level towards a lake named *Zacvia*, into which many rivers, whoſe ſtreams contribute to increaſe that of the Nile, empty themſelves; and had this been accompliſhed, there is no doubt that the loſs of ſo much water would have been very ſenſibly felt by the Egyptians. According to moſt hiſtorians, this enterprizing monarch was prevented by death from putting his deſign in execution; though Mr Bruce informs us of a written account at Shoa, in which it was aſſerted, that he was diſſuaded from it by certain monks, who told him, that by ſending down ſuch a quantity of water to the eaſtern and dry parts of Africa, theſe countries would ſoon become ſo fertile and populous that they would rival the empire of Ethiopia, or at leaſt withdraw their allegiance from it entirely. The remains of theſe works were ſeen by the Portugueſe ambaſſador in 1522.

52 eſtoration the line Solomon.

All this time the princes of the line of Solomon had been obliged to content themſelves with the ſovereignty of the province of Xoa or Shoa, without making any attempt to regain their former dignity; but they were unexpectedly reſtored without bloodſhed or diſturbance by Naacueto Laeb the grandſon of Lalibala above mentioned. This prince, being of a gentle and pacific diſpoſition, was perſuaded by a monk named *Tecla Haimanout*, greatly celebrated for his ſanctity, to reſign the crown, to which, though he received it from his father, he could not pretend any abſolute right. In conſequence of the mediation of this monk, therefore, it was agreed that Naacueto ſhould give up the empire to Icon Amlac the lineal deſcendant of Solomon, who then poſſeſſed the ſovereignty of Shoa. In conſequence of this a portion of lands ſhould be irrevocably and irredeemably aſſigned to him and his heirs; and he ſhould likewiſe be allowed ſome marks of ſovereignty as a teſtimony of his former grandeur. In this treaty, however, the good monk did not forget his own intereſt. He had founded a famous monaſtery in Shoa, and was primate of the whole empire under the title of *Abuna*. He now inſiſted that one third of the kingdom of Ethiopia ſhould be abſolutely ceded to himſelf for the maintenance of his own dignity, and the ſupport of the clergy, convents, &c. throughout the country; he alſo inſiſted that no native Abyſſinian ſhould ever enjoy the ſame dignity with himſelf, even though he ſhould have been choſen and ordained at Cairo, as was the cuſtom with the Abyſſinian prelates.

53 Uncertainty of the Abyſſinian hiſtory for a conſiderable time.

Theſe extraordinary terms were complied with, and Icon Amlac raiſed to the throne of Ethiopia. He did not, however, remove the ſeat of government from the province of Shoa; but continued at Tegulat the capital of that province during the whole of his lifetime, which continued 15 years after his acceſſion to the throne of Ethiopia. We are ignorant of the tranſactions of his reign, as well as that of ſeveral of his ſucceſſors; five of whom aſcended the throne in as many years. From this quick ſucceſſion Mr Bruce is of opinion, that a civil war had taken place among the candidates for the throne: but the Abyſſinian annals make no mention of this; neither have we any particular account of the tranſactions of the empire till the time of Amda Sion, who began to reign in 1312. He was the ſon of Wedem Araad, the youngeſt brother of Icon Amlac, and ſucceeded to the throne on the death of his father. He profeſſed the Chriſtian religion; but his practice ſeems to have been very oppoſite to its precepts. He began his reign with living publicly with a concubine of his father's; and quickly after committed inceſt with his two ſiſters. On this he was firſt exhorted to repentance, and then excommunicated, by Honorius, a monk greatly celebrated for his ſanctity, and who has ſince been canonized. The prince, enraged at this indignity, cauſed the ſaint to be ſeverely whipped through every ſtreet of his capital. That night the town was by ſome unknown means ſet on fire and reduced to aſhes: the clergy perſuaded the people, that the blood of Honorius had turned to fire as it dropped on the ground, and thus occaſioned the cataſtrophe; but the king ſuſpecting that the monks themſelves had been the incendiaries, baniſhed or impriſoned them all, ſo that their hopes of exciting an inſurrection were diſappointed; and being diſperſed into thoſe provinces where the inhabitants were moſtly Jews or Pagan, they were now obliged to apply to what was certainly more incumbent upon them, viz. the diffuſion of the knowledge of the goſpel.

54 Reign of Amda Sion.

55 He is excommunicated for inceſt.

56 The monks baniſhed.

While the king was buſied with the monks, one of the factors, who had been entruſted with ſome of his commercial intereſts, was aſſaſſinated by the Moors in the province of Ifat; on which, without making the leaſt complaint or expoſtulation, he aſſembled his troops, and with *ſeven* horſemen (A) fell upon the neareſt Mahometan ſettlements, maſſacring all he met without exception. Putting himſelf then at the head of his army, he proceeded in the moſt rapid career of deſolation, laying waſte the whole country with fire and ſword, and carrying off an immenſe booty.

57 His expedition againſt the Mahometans.

For ſome time the Moors were ſo ſurpriſed that they did not think of making oppoſition; but at laſt they took up arms, and attempted to ſurpriſe the

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(A) On this Mr Bruce remarks, that "it has been imagined the number ſhould be increaſed to 70; but there would be little difference in the raſhneſs of the action." The word in the byſſinian annals which he tranſlates is *ſeven*; but if we increaſe the number at all, it ought more probably to be to *ſeven hundred* than ſeventy.

58
They attack his camp in the night without ſucceſs.

Abyſſinian monarch in his camp, hearing that he had ſent out moſt of his army in detachments. With this view they approached the camp in the night-time, expecting to have found the king and his few ſoldiers immerſed in ſleep. Unexpectedly, however, he had been joined by a conſiderable part of his army, whom he drew up in battle array to receive his enemies. An engagement enſued, in which the king behaved with great valour; killed the Mooriſh general with his own hand, and gained a complete victory. He then commanded ſuch of his ſoldiers as could not find houſes ready built, to build huts for themſelves, and a large tract of land to be plowed and ſown, as if he meant to ſtay in the country of the enemy during the rainy ſeaſon.

59
They ſubmit, but quickly revolt again.

The Mahometans now perceiving that they were in danger of being totally exterminated, willingly ſubmitted to the terms he pleaſed to impoſe upon them; while the monach conciliated the affections of his people by dividing among them the vaſt plunder he had acquired in this expedition.

The Moors no ſooner found themſelves freed from any apprehenſions of immediate danger, than they prepared for a new revolt. The king having intelligence of their deſigns, ſecretly prepared to ſubdue them before they could have time to bring their matters to a ſufficient bearing. The Moors, however, being better prepared than he expected, began hoſtilities by ſurpriſing and plundering ſome villages belonging to the Chriſtians, and deſtroying their churches. A moſt formidable combination had taken place; and as the conſequence of allowing the confederate rebels to join their forces might have been very dangerous, the king uſed his utmoſt endeavours to prevent it.

60
King of Hadea defeated and taken priſoner.

This deſign was in ſome meaſure facilitated by the ſuperſtition of Amano king of Hadea, one of the principal rebels. This man, by the advice of a conjurer in whom he put great confidence, inſtead of marching his troops to the aſſiſtance of his allies, remained at home with them, where he was defeated and taken priſoner by a detachment of the king's army. The governor of Amhara was next diſpatched againſt Saber-eddin the revolted governor of Fatigar, with orders to lay waſte the country, and uſe every method to force him to a battle, if he ſhould be diſinclined to venture it himſelf.

61
Another rebel chief defeated.

Theſe orders were punctually executed; Saber-eddin was compelled to ſtand an engagement, in which he was defeated; the victors plundered his houſe, and took his wife and children priſoners. But in the mean time intelligence was received of a new revolt among the Falaſha, who had aſſembled a great army, and threatened to become very formidable; their chief keeping a cloſe correſpondence with Saber-eddin, as well as with the king of Adel.

62
The Falaſha defeated.

Theſe, however, ſhared the ſame fate with the reſt, being entirely defeated by Tzaga Chriſtos another Abyſſinian general, who ſoon after joined the king with his whole army. This proved fatal to the rebel cauſe: Saber-eddin, no longer able to ſupport himſelf againſt the royal forces, was obliged to ſurrender at diſcretion, and all the reſt were quickly reduced; ſo that the king was at leiſure to march againſt the kings of Adel and Mara, who having now united their forces, reſolved to give him battle.

63
The king marches againſt Adel, Mara, &c.

At this the Abyſſinian monarch was ſo exaſperated, that he determined to take a moſt ample vengeance on his enemies. In the preſence of his whole army, therefore, and a monk of uncommon ſanctity dreſſed in the ſame habit in which he uſually performed divine ſervice, the king made a long ſpeech againſt the Mahometans.

64
His ſpeec
and oath
preſence
his army.

He recounted the many violences which they had committed; and of which the kings of Adel and Mara had been principal promoters. He enumerated many examples of murder, ſacrilege, &c. of which they had been guilty; ſetting forth alſo that they had carried off great numbers of Chriſtians into ſlavery, and that the view of making ſlaves was now a great motive with them for making war. He diſclaimed every idea of commencing hoſtilities from any avaricious motive; as a proof of which, he denied that he would accept of any part of the plunder for his own uſe; concluding with a declaration, that he was now about to ſwear on the holy euchariſt, that, "though but 20 of his army ſhould join him, he would not turn his back upon Adel or Mara, till he had either forced them to tribute and ſubmiſſion, or entirely extirpated them and annihilated their religion." After this ſpeech, he took the oath in the preſence of the whole army; who not only applauded him with loud ſhouts, but proteſted that they looked upon themſelves to be all bound by the oath he had taken.

65
Enthuſiaſ
of his
troops.

As he had mentioned in his ſpeech that the plunder had been purchaſed by the lives of their Chriſtian brethren, they determined to ſhow their abhorrence at keeping any of it on theſe terms. Taking lighted torches in their hands, therefore, they ſet fire to the whole plunder that had been amaſſed ſince the beginning of the war; and having thus reduced themſelves to a ſtate of poverty, they prepared to ſhow their Chriſtianity by thirſting, not after the wealth, but the blood of their enemies.

66
Exceſſive
ſuperſtitio
of both p
ties.

Notwithſtanding the enthuſiaſm of the whole army on this occaſion, the expedition was attended with great difficulties. Theſe aroſe principally from ſuperſtition; and as, on the one hand, the Abyſſinians were by this principle laid under conſiderable diſadvantages, their adverſaries on the other enjoyed equal advantages from no better cauſe. The Abyſſinians, according to Mr Bruce, are very credulous with reſpect to genii or ſpirits which go about doing miſchief in the dark. Hence they are afraid of travelling, but eſpecially of fighting, in the night-time; becauſe they imagine that the world is then entirely given up to theſe beings, who are put out of humour by the motions of men, or of any other terreſtrial creature. In the night-time therefore an Abyſſinian dares not even throw a little water out of a baſon, leſt it ſhould fall upon ſome ſpirit and provoke it to vengeance. The Moors, on the other hand, though equally fearful, ſecure themſelves againſt theſe inviſible enemies by means no leſs ridiculous than the fears themſelves. A verſe of the Koran, ſewed up in leather, and worn round their neck or arm, is ſufficient to defy the power of the moſt miſchievous genii. Under ſuch powerful protection, therefore, they laugh at the terrors of the Abyſſinians, and are on all occaſions ready to attack them in the night-time, and even chooſe that ſeaſon rather than any other for coming to an engagement. Senſible of this advantage, and encouraged by the little loſs which attended even a defeat in theſe nocturnal encounters, they determined on the preſent occaſion to avoid any pitched battles, and to content themſelves with haraſſing the king's army by continual ſkirmiſhes of

67
The king
troops ha
raſſed by
frequent
encounte

this kind. Thus, though the Abyſſinian monarch had always the advantage, his troops ſoon began to complain; and, on the commencement of the rainy ſeaſon, inſiſted on being allowed to return.—This was by no means agreeable to a prince of ſuch a martial diſpoſition as Amda Sion. He therefore told them, that, if they were afraid of rains, he would conduct them to a country where there were none; meaning Adel, which, though likewiſe within the limits of the tropical rains, has them at another ſeaſon than that in which they fall in Abyſſinia. Thus he perſuaded his army again to ſet forward: but was ſo grievouſly haraſſed by the nocturnal attacks of the Moors, that he was once more in danger of being deſerted; and when by his eloquence he had found means to diſſipate the apprehenſions of the ſoldiers, he was ſeized with ſuch a violent fever as threatened his life.

68
is ſeized
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The ſoldiers now expected that they were ſoon to return; but while they indulged themſelves in the careleſſneſs which uſually attends an expectation of this kind, they accidentally received intelligence that the Moors, having aſſembled an army of 40,000 men, were in full march to attack them, and at a very ſmall diſtance. The king was now free from fever, but ſo weak that he fainted on attempting to put himſelf in readineſs for going out to battle. Still, however, his reſolution continued firm and unalterable; having recovered from his faint, waſhed and refreſhed himſelf, he made a ſpeech to his ſoldiers, filled with the moſt enthuſiaſtic expreſſions of confidence in the juſtice and goodneſs of the cauſe in which he was engaged, and in the continuance of the divine favour and protection. "As it never was my opinion (ſaid he), that it was my own ſtrength and valour, or their want of it, which has ſo often been the cauſe of preſerving me from their hands; ſo I do not fear at preſent that my accidental weakneſs will give them any advantage over me, as long as I truſt in God's power as much as I have ever done." By this ſpeech the drooping ſpirits of the Abyſſinians were revived; and they only begged that their monarch would now truſt to the valour of his troops, and not expoſe his perſon to ſuch danger as he had uſually done.

69
troops
earten-

He promiſed to comply with their requeſt; but matters were ſoon thrown into confuſion by a report that the Moors had poiſoned the wells and enchanted all the running water in the front of the army. The poiſoned wells, however, were eaſily avoided; and a prieſt of vaſt ſanctity was diſpatched a day's journey before the army to diſenchant the waters by his bleſſings; which, having the advantage of the good qualities of the element itſelf on their ſide, were doubtleſs more powerful than the ſpells of the infidels. Not content with this, the king cauſed a river to be conſecrated by the name of *Jordan*; but while his men were employed in bathing themſelves in this holy water, the *Fits-Auraris*, an officer who had been diſpatched with a party of men who always go before the Abyſſinian armies, was attacked and driven back on the main body by a detatchment of the enemy, who had along with them a number of women provided with drugs to poiſon and ſpells to enchant the waters.

70
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On this a dreadful panic ſeized the whole army; who, unmindful of the promiſes made to their king. not only refuſe! to advance, but for the moſt part came to the reſolution of leaving their camp, and returning homewards without delay. The king, ſenſible that all was loſt if this pernicious ſcheme ſhould be adopted, did his utmoſt to encourage and perſuade them to return to their duty; but perceiving that nothing was to be gained by reaſoning with men ſo much terrified, he only requeſted that ſuch as could not be induced to fight, would not leave their places, but ſtand quiet ſpectators of the battle.

71
He begins the fight with a very few attendants.

Even this had very little effect: ſo that, finding the enemy now ready to make an attack, he ordered his maſter of the horſe, with only five others, to attack the left wing of the enemy; while he, with a ſmall party of his ſervants, made an attack on the right. This deſperate action was attended with ſucceſs. The king, notwithſtanding the weakneſs he yet laboured under, killed with his own hand two of the commanding officers of the enemy's right wing; while his ſon diſpatched another of conſiderable rank belonging to the left. This had ſuch an effect upon the whole Mooriſh army, that they began evidently to loſe courage; while the Abyſſinians, aſhamed of their conduct, now ruſhed furiouſly on to reſcue their prince from danger. The battle continued for ſome time with great obſtinacy; but at laſt the centre and left wing of the Moors were entirely defeated.

72
The Moors defeated,

The right wing, compoſed principally of Arabians, retired in a body; but, not knowing the country, they entered a deep valley ſurrounded by perpendicular rocks entirely covered with wood. The Abyſſinians, imagining they had nothing more to do, began to ſtrip and mangle the bodies of the killed and wounded; but the king, perceiving that the Arabians had brought themſelves into a ſituation from whence they never could be extricated, obliged his ſoldiers to deſiſt from this barbarous employment, and even killed two of them who diſobeyed his orders.

73
And almoſt entirely cut off.

The army was then divided into two parts, one of which ſurrounded the devoted Arabians, while the other was ſent a day's journey after the remainder of the Moors. Both parties proved equally ſucceſsful. The king with part of his diviſion attacked the Arabians in front, while the reſt rolled great ſtones down from the tops of the rocks upon them. By this they were thrown into ſuch confuſion, that being neither able to fly nor reſiſt, they were all killed to a man. The fate of the Moors was little better. The other diviſion of the Abyſſinian army found them lying round a large pool of water which they lapped like as many dogs. In this helpleſs ſituation there was nothing requiſite but to order them to be ſlaughtered; and this cruel order was executed with the utmoſt preciſion. The ſoldiers, imagining they ſhould now diſcharge their vow to heaven, wearied themſelves with ſlaughter; till at laſt, being almoſt ſatiated with blood, they made a few priſoners, among whom was Saleh king of Mara with his queen; the former of whom was hanged by order of Amda Sion, and the latter cut in pieces and her body given to the dogs by the ſoldiers.

74
Amda Sion purſues his advantage.

This ſignal victory was gained in the end of July 1316; but as the rains at that ſeaſon ſet in with violence, moſt of the army now again inſiſted on their returning home without delay. The king and principal officers, however, were of opinion, that the advantages ſo dearly purchaſed ought by all means to be purſued till they had either reduced the Mahometans to ſubjection, or at leaſt deprived them of all power to make attacks on the empire with any proſpect of ſucceſs. This opinion being adopted, the king ſent back the baggage, women, and others who could be of no uſe to the army; retaining only the veteran ſoldiers, who were able to encounter more than ſix times the number of ſuch enemies as he could expect to meet with. Advancing farther into the Mahometan territories, he took up his reſidence in a large town called *Zeyla*; from whence he, that very night, ſent out a detachment to ſurpriſe a large village in the neighbourhood named *Taraca*. This was executed with ſucceſs; the men were maſſacred, and the women kept to ſupply the places of thoſe who had been ſent away. Continuing ſtill to advance, he detached parties to lay waſte the countries all round; and in this expedition he had the good fortune to cut off two of the principal authors of the conſpiracy againſt him. He then proceeded to invade Talab and Abalge in the territories of the king of Adel. That monarch, now rendered deſperate by the view of approaching ruin, had aſſembled all the troops he could raiſe, in order to make one laſt effort againſt the enemy; but conducted himſelf with much leſs prudence than he ought to have done when contending with ſuch an experienced and vigilant adverſary. Amda Sion, confident of ſucceſs, took no leſs care how to prevent the enemy from eſcaping than how to gain the victory. For this purpoſe he diſpatched parties of horſe to lie in wait in all thoſe avenues by which he ſuppoſed that the Moors might attempt to make their eſcape; after which, falling furiouſly on the Adelians himſelf, and being well ſupported by his troops, he gained a complete victory; the king of Adel, with great numbers of his men, being killed on the ſpot, and almoſt all the reſt by the parties of horſe whom the Abyſſinian monarch had poſted in ambuſh to intercept them.

75 His further conqueſts.

76 Adel invaded.

77 The king of Adel defeated and killed.

As the loſs of this battle rendered the affairs of the Adelians quite deſperate, the three young princes, ſons to the late king, with their uncle, waited upon Amda Sion with rich preſents, which they laid at his feet in the moſt humble manner, putting their foreheads in the duſt, and intreating his pardon; profeſſing their ſubjection and readineſs to obey his commands, provided that he would ſpare the remainder of their country and property. To this the king made a very unfavourable reply, reproaching them with indignities done to himſelf; but eſpecially with the ſacrilege they had committed in burning churches and murdering prieſts, deſtroying alſo defenceleſs people in villages, merely becauſe they imagined that he would not protect them. To puniſh theſe and other crimes, he ſaid, he was now in the heart of their country; and he was determined never to turn his back upon Adel while he had ten men capable of drawing their ſwords; for which reaſon he commanded them to return and expect the approach of his army.

78 The princes of Adel ſubmit.

By this fierce ſpeech the brother and two eldeſt children of the king of Adel were ſo diſheartened, that they could not ſpeak; but the youngeſt ſon made a very ſpirited ſpeech, in which he attempted to ſoften the king by complimenting his valour, and ſhowing that it was unworthy of his character to puſh the war againſt a people who were already conquered and defenceleſs. All the anſwer he could obtain, however, was, that unleſs the queen with the reſt of the royal family, and the principal people of the nation, would come by to-morrow evening and ſurrender themſelves as the princes had done, he would lay waſte the territory of Adel, from the place where he ſat to the Indian ocean. On this the princes earneſtly requeſted their mother to ſubmit without reſerve to the clemency of the Abyſſinian monarch, and to wait upon him next morning; but ſhe was prevented from this by ſome of the nobility who had formerly adviſed the war, and who juſtly ſuſpected danger to themſelves if they ſhould be obliged to ſubmit unconditionally to the conqueror. They reſolved, therefore, to venture a battle once more; and the better to enſure ſucceſs, they bound themſelves by an oath to ſtand by each other to the laſt extremity. At the ſame time they diſpatched meſſengers to the princes, requeſting them to make their eſcape with all manner of expedition, and to head the army themſelves; all of whom were determined to conquer or die as ſoon as the royal family ſhould be out of the enemy's hands. By this conduct the Abyſſinian monarch was ſo much irritated, that he divided his army into three parts; two of which he commanded to enter the territory of the enemy by different routes, and to exterminate both man and beaſt wherever they came; while he himſelf, with the third, took the ſtraight road to the place where the new Adelian army was encamped. Here he found a number of infantry drawn up and ready to engage him; but, beſides theſe, there was a multitude of old men, women, and even children, all armed with ſuch weapons as they could procure. Surpriſed at this ſight, he ordered a party of horſe to diſperſe them; but this was found impoſſible; ſo that he was obliged to call in the detachments he had ſent out, with orders to fall upon the enemy by the neareſt way they could advance. The engagement was for a long time very doubtful; and in oppoſition to Amda Sion appeared the young king of Wypo, who every where encouraged his troops, and made the moſt obſtinate reſiſtance. The Abyſſinian monarch having obſerved him, ſheathed his ſword, and arming himſelf with a bow, choſe the broadeſt arrow he could find, and took ſo juſt an aim, that he ſhot the young prince through the ſide of the neck, and his head inclining to one ſhoulder he ſoon fell down dead. On this the ſpirit of the Adelians entirely forſook them, and they betook themſelves to flight; but unluckily falling in with two Abyſſinian detachments coming to the king's relief, they were ſo completely deſtroyed, that only three of them are ſaid to have made their eſcape. On the ſide of the Abyſſinians, however, the victory was dearly purchaſed; many of the principal officers being killed, and ſcarcely one of the cavalry eſcaping without a wound.

79 Are unfavourably received.

80 The war continue

81 An obſti nate batt

82 The M ſh arm entirely off.

The remainder of this expedition conſiſted only in the deſtruction and burning of towns and villages, and maſſacres of helpleſs people, on pretence of retaliating the injuries committed by the Mahometans againſt the Chriſtians. At laſt, weary of conqueſt and of carnage, this victorious monarch, who never ſuffered a defeat in any battle, returned in triumph to his capital, where he ended his days after a reign of 30 years. In his time we find that the royal family were not confined, as had been the uſual practice from the time of the queen of Sheba to the maſſacre by Judith; for Saif Araad, the ſon and ſucceſſor of Amda Sion, diſtinguiſhed himſelf in one of the battles in which his father was engaged.

83 Dreadfu devaſtations.

84 The roy family confined as form ly.

Though the new prince, as appears from what has

been

85
gn of
Araad.

been juſt now obſerved, was by no means deſtitute of military talents, the Abyſſinian empire enjoyed a profound peace during his reign. The only remarkable tranſaction was the relief given by him to the Coptic patriarch, whom the ſultan of Egypt had thrown into priſon. At this time a great trade was carried on through the deſart by caravans between Cairo and Abyſſinia, as well as from Cairo and Suakem on the Red Sea; but the Ethiopic monarch having ſeized the merchants from Cairo, and ſent parties of horſe to interrupt the caravans in their paſſage, the ſultan was ſoon content to releaſe the patriarch, whom he had impriſoned only with a view to extort money.

86
Theod

87
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In the reign of Theodorus, who held the crown of Ethiopia from the year 1409 to 1412, we find an infringement made on the treaty between Icon Amlac and the Abuna Tecla-Haimanout formerly mentioned. By that treaty the Abuna was to have a full third of the whole empire for the ſupport of his own dignity and that of the church: but Theodorus, juſtly conſidering this as an unreaſonable acquiſition, reduced it very conſiderably, though he ſtill allowed a very ample revenue out of every province of the empire; and even this has been conſidered by ſeveral of his ſucceſſors as far too large, and has conſequently been frequently abridged by them. The annals of this prince's reign are very defective, and Mr Bruce ſuppoſes that they have been mutilated by the eccleſiaſtics; which, conſidering what we have juſt now related of his reducing their revenues, is by no means improbable. By his ſubjects he was conſidered as ſuch a ſaint, that to this day the people believe he is to riſe again and to reign a thouſand years in Abyſſinia; during which period war is to ceaſe, and happineſs to be univerſally diffuſed.

88
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89
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Florence.

90
party for
e church
Rome
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From the time of Theodorus to that of Zara Jacob, who began his reign in 1434, the Abyſſinian annals furniſh us with little or nothing of any conſequence. The character of this prince is repreſented as by no means inferior to that of Theodorus, or indeed of any monarch that ever ſat on the throne of Ethiopia, or any other kingdom in the world. He is in ſhort ſet forth as another Solomon, and a model of what ſovereigns ought to be; though, from ſome particulars of his reign, this character ſhould ſeem to be rather exaggerated. The firſt remarkable tranſaction of this great monarch was his ſending an embaſſy to the council of Florence. The ambaſſadors were certain prieſts from Jeruſalem, who in that aſſembly adhered to the opinions of the Greek church; and the embaſſy itſelf was judged to be of ſuch conſequence as to be the ſubject of a picture in the Vatican. This prince obtained alſo a convent at Rome from the pope for the uſe of the Abyſſinians; which is ſtill preſerved, though very ſeldom viſited by thoſe for whom it was deſigned. He ſeems to have been very deſirous of keeping up a correſpondence with the Europeans as well as the Aſiatics; and in his time we firſt read of a diſpute in Abyſſinia with the *Frangi* or Franks on the ſubject of religion. This was carried on in preſence of the king between one Abba George and a Venetian painter, Franciſco de Branco Lone, in which the former confuted and even convinced his antagoniſt; but from this time we find a party formed for the church of Rome, and which probably took its riſe from the embaſſy to the council of Florence.

91
Religious
perſecution
introduced.

92
Amda Sion
a cruel inquiſitor.

93
Murder of
the king's
ſons in-law.

94
Perſecution
ſuppreſſed.

The prince of whom we now treat was the firſt who introduced perſecution on a religious account into his dominions; and for this reaſon moſt probably he is ſo highly commended by the eccleſiaſtics. The ſtate of religion in Abyſſinia was now indeed very corrupt. The Greek profeſſion had been originally eſtabliſhed from the church of Alexandria; but in the low provinces bordering on the coaſt of Adel, the Mahometan ſuperſtition prevailed. Many of that perſuaſion had alſo diſperſed themſelves through the towns and villages in the internal parts of the empire, while in not a few places the groſſeſt idolatry ſtill took place; ſuch as the worſhip of the heavenly bodies, the wind, trees, cows, ſerpents, &c. All this had hitherto paſſed unnoticed; but in the reign of Zara Jacob, ſome families being accuſed of worſhipping the cow and ſerpent, were brought before the king, who pronounced ſentence of death upon them. Their execution was followed by a royal proclamation, that whoever did not carry on his right hand an amulet with theſe words upon it, "I renounce the devil for Chriſt our Lord." ſhould not only forfeit his perſonal eſtate, but be liable to corporal puniſhment. The ſpirit of perſecution thus begun, quickly diffuſed itſelf, and an inquiſitor was appointed to ſearch for criminals. This was one Amda Sion, the king's chief confident, who pretended to all that abſurd and auſtere devotion common to religious hypocrites. In this he was flattered with uncommon parade and attendance, the uſual rewards of people of that ſtamp; as he never appeared abroad but with a great number of ſoldiers, trumpets, drums, and other enſigns of military dignity waiting upon him. He kept alſo a number of ſpies, who brought him intelligence of thoſe who were ſecretly guilty of any idolatrous or treaſonable practices; after which, proceeding with his attendants to the houſe of the delinquent, he cauſed the family firſt ſupply himſelf and his party with refreſhments, and then ordered the unhappy wretches to be all put to death in his preſence. Among thoſe who ſuffered in this barbarous manner were the two ſons-in-law of the king himſelf, who had been accuſed by their wives, the one of adultery, and the other of inceſt; on which ſlight ground they were both put to death in their own houſes in ſuch a manner as deſervedly threw an odium on the king. His conduct was afterwards ſo ſeverely condemned by certain clergymen from Jeruſalem, that a reformation ſeems to have been produced; and no mention is afterwards made of the inquiſitor or perſecution during this reign.

95
Affairs of
the kingdom regulated

96
Churches
repaired.

The attention of the king was now called off from religion to the ſtate of his affairs in the different provinces of the kingdom. As the Mooriſh provinces were very rich, by reaſon of the extenſive trade they carried on, and frequently employed their wealth in exciting rebellions, it became neceſſary that the ſovereign himſelf ſhould examine into the circumſtances and diſpoſitions of the ſeveral governors; which was likewiſe proper on another account, that he might aſſign to each the ſum to be paid. On this occaſion he divided the empire more diſtinctly, and increaſed the number of governments conſiderably; which being done, he ſet about repairing the churches throughout the country, which had fallen into decay, or been deſtroyed in the war with the Mahometans. So zealous was he in this reſpect, that having heard of the deſtruction of the church of the Virgin in Alexandria by fire, he inſtantly built another in Ethiopia, to repair the loſs which Chriſtianity might have ſuffered.

The laſt public tranſaction of this prince's reign was the quaſhing of a rebellion which ſome of his governors had entered into; but whatever glory he might acquire from this or any other exploit, his behaviour with regard to his domeſtic affairs muſt certainly place him in a very diſadvantageous light.

97
The queen put to a cruel death.

In the decline of the king's life, the mother of the heir apparent conceived ſuch an extreme deſire to behold her ſon in poſſeſſion of the throne, that ſhe began to form ſchemes for obliging his father to take him into partnerſhip with him in the government. Theſe being diſcovered, her huſband cruelly cauſed her to be whipped to death: and finding that his ſon afterwards performed certain ſolemnities at her grave in token of regard for her, he cauſed him to be loaded with irons and baniſhed to the top of a mountain; where he would probably have been put to death, had not the monks interfered. Theſe having invented prophecies, dreams, and revelations, that none but the young prince Bæda Mariam was to poſſeſs the throne, the old king ſubmitted to the decrees of heaven, and relaxed in his ſeverity.

98
The royal family again confined.

On the acceſſion of the new king in 1468, the old law for impriſoning all the royal family was revived, and a mountain named *Geſhen* choſen for the purpoſe. Having thus ſecured himſelf from any danger of a rival in caſe he ſhould undertake a foreign expedition, he proclaimed a pardon to all thoſe who had been baniſhed during the former reign, and thus ingratiated himſelf with his people; after which he began to prepare for war.

99
War with the Dobas reſolved on.

At this the neighbouring princes, particularly the king of Adel, being alarmed, ſent ambaſſadors requeſting the continuance of peace. The Abyſſinian monarch told them, that his deſign was to deſtroy the Dobas; a race of Shepherds very wealthy, but extremely barbarous, profeſſing the pagan religion, and greatly reſembling the Gallas. The reaſon of his commencing hoſtilities againſt them was, that they made continual inroads into his country, and committed the greateſt cruelties; on which account he determined not to make war as with a common enemy, but to exterminate and deſtroy them as a nuiſance. The king of Adel was no ſooner poſſeſſed of this piece of intelligence, than he communicated it to the Dobas; deſiring them to ſend their women and children, with their moſt valuable effects, into his country, till the invaſion ſhould be over.

100
They are maſſacred.

This propoſal was readily embraced; but Bæda having got notice of it, ſeized an avenue through which they muſt neceſſarily paſs, and maſſacred every one of the company. After this, entering their country, he committed ſuch devaſtations, that they were glad to ſubmit, and even to renounce their religion in order to free themſelves from ſuch a dreadful enemy. The king then turned his arms againſt Adel, where he was attended with the uſual ſucceſs; a moſt complete victory being gained over the Moors by the Abyſſinian general: but while the king himſelf was advancing towards that country, with a full reſolution to reduce it to the moſt abject ſtate of miſery, he was ſeized with a pain in his bowels, which occaſioned his death.

101
Death of the king.

The diſcovery of the kingdom of Ethiopia or Abyſſinia by the Europeans took place about this time. It has already been obſerved, that ſome intercourſe by means of individuals had been carried on betwixt this country and Italy; but the knowledge conveyed to Europeans in this manner was ſo imperfect and obſcure, that it ſcarce amounted to any thing.

102
Diſcovery of Ethiopia by the Europeans.

Even the ſituation of the country had been forgot; and though ſome confuſed notions were entertained of a diſtant Chriſtian prince who was likewiſe a prieſt, Marco Paulo, the famous Venetian traveller, affirms, that he had met with him in Tartary; and it was univerſally agreed that his name was *Joannes Preſbyter*, *Prete Janni*, or *Preſter John*.

103
Of Preſter John.

When the Portugueſe began to extend their diſcoveries along the coaſt of Africa, more certain intelligence concerning this prince was obtained. Bemoy, one of the kings of the Jaloſſes, a nation on the weſtern coaſt of Africa, had aſſured the Portugueſe navigators of the exiſtence of ſuch a prince ſo ſtrongly, that the king determined to ſend ambaſſadors to him; and the diſcovery was of the greater conſequence, that a paſſage to the Eaſt Indies was now attempted both by land and ſea.

104
Ambaſſadors ſent from the king of Portugal.

The ambaſſadors were named *Peter Covillan* and *Alphonſo de Paiva*. Theſe were ſent to Alexandria in Egypt, from whence they were to ſet out on their journey; the intent of which was, to explore the ſources of the Indian trade, the principal markets for the ſpice, &c. but above all, to diſcover whether it was poſſible to arrive at the Eaſt Indies by ſailing round the continent of Africa.

105
Account of their travels.

In the proſecution of this ſcheme our two travellers went from Alexandria to Cairo; from thence to Suez at the bottom of the Red Sea; from Suez they took their route to Aden, a wealthy and commercial city beyond the ſtraits of Babel Mandel. Covillan now ſet ſail for India, and De Paiva for Suakem. The latter loſt his life without making any diſcovery; but Covillan paſſed over to Calicut and Goa. From thence he returned to the continent of Africa, viſiting the gold mines of Sofala, and paſſing from thence to Aden and Cairo; at which laſt place he was informed of the death of his companion. In this city he was met by two Jews with letters from the king of Abyſſinia. One of theſe Jews was ſent back with letters to the Abyſſinian monarch: but with the other he proceeded to the iſland of Ormus in the Perſian gulf. Here they ſeparated; the Jew returning home, and Covillan repaſſing the ſtraits of Babel Mandel, whence he proceeded to Aden, and afterwards entered the Abyſſinian dominions.

The reigning prince at this time was named *Alexander*; and when Covillan arrived, he was employed in levying contributions upon his rebellious ſubjects. He met with a kind reception; and was conveyed to the capital, where he was promoted to the higheſt poſts of honour, but never allowed to return to Europe again.

106
Important intelligence conveyed to Portugal by Covillan.

The intelligence, however, which he tranſmitted to the court of Portugal proved of much importance. He not only deſcribed all the ports of India he had ſeen, with the ſituation and wealth of Sofala, but adviſed the king to proſecute the diſcovery of the paſſage round Africa with the utmoſt diligence; affirming, that the Cape at the ſouthern extremity of the continent was well known in India; and accompanying the whole with a chart which he had obtained from a Moor, and which ſhowed exactly the ſituation of the Cape and neighbouring countries.

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Covillan arrived in Ethiopia about the year 1490; and the prince to whom he addreſſed himſelf was Alexander the ſon of Bæda Mariam. He ſeems to have been endowed with many good qualities, and no leſs verſed in military affairs than any of his predeceſſors.

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l Adel.

His reign was diſturbed by plots and rebellions, which at laſt proved fatal to him. From his early years he manifeſted a great deſire to make war on the king of Adel, who ſeems to have been the natural rival of the Ethiopic princes. But the Adelian monarch, having now become ſenſible that he was not able to cope with ſuch powerful adverſaries, took the moſt effectual way of ſecuring himſelf; *viz.* by gaining over a party at the court of Abyſſinia. In this he had now ſucceeded ſo well, that when Alexander was about to invade Adel, Za Saluce the prime miniſter, with many of the principal nobility, were in the intereſt of his adverſary.

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Not being apprized of this treachery, however, Alexander entruſted this miniſter with the command of a great part of his forces; and with theſe the latter abandoned him in the heat of an engagement. Alexander and the few troops who remained with him, however, were ſo far from being diſheartened by this treachery, that they ſeemed to be inſpired with freſh courage. The king having killed the ſtandard-bearer of the enemy, and thus become maſter of the green enſign of Mahomet, the enemy began to give way; and on his killing the king of Adel's ſon, immediately after they quitted the field altogether. The victory was not by any means complete; neither was Alexander in a ſituation to purſue the advantage he had gained. Having therefore challenged the Moors to a ſecond engagement, which they declined, he returned with a deſign to puniſh his perfidious miniſter Za Saluce, who had endeavoured to excite the governors of all the provinces to revolt as he went along. The traitor, however, had laid his plots too well; ſo that his ſovereign was murdered in two days after his arrival in the capital.

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Za Saluce did not enjoy the rewards he expected from his treachery: for having attempted to excite a revolt in the province of Amhara, he was attacked by the nobility there; and his troops deſerting him, he was taken priſoner without any reſiſtance, his eyes were put out, and himſelf expoſed on an aſs, to the curſes and deriſion of the people.

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Alexander was ſucceeded by an infant ſon, who reigned only ſeven months; after which his younger brother Naod was choſen king by the unanimous voice of the people. He proved a wiſe and virtuous prince; but the late misfortunes, together with the corruption introduced at court by the Mahometans, had ſo unhinged the government, that it became very difficult to know how to manage matters. Judging very properly, however, that one of the moſt effectual methods of quieting the minds of the people would be an offer of a general pardon; he not only proclaimed this, but likewiſe, "That any perſon who ſhould upbraid another with being a party in the misfortunes of paſt times, or ſay that he had been privy to this or that conſpiracy, had received bribes from the Moors, &c. ſhould be put to death without delay."

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On his entering upon government, he found it neceſſary to prepare againſt an enemy whom we have not heretofore mentioned, *viz.* Maſſudi, prince of a diſtrict named *Arar*, which lay in the neighbourhood of Adel. This chieftain being a man of a very enterpriſing and martial diſpoſition, and a moſt violent enthuſiaſt in the Mahometan cauſe, had made a vow to ſpend 40 days annually in ſome part of the Abyſſinian dominions during the time of Lent. For this purpoſe he kept a ſmall body of veteran troops, with whom he fell ſometimes on one part, and ſometimes on another of the frontiers of Ethiopia, putting to death without mercy ſuch as made reſiſtance, and carrying off for ſlaves thoſe who made none. For 30 years he continued this practice; beginning exactly on the firſt day of Lent, and proceeding gradually up the country as the term advanced. His progreſs was greatly facilitated by the ſuperſtition of the people themſelves, who kept that faſt with ſuch rigour as almoſt entirely to exhauſt their ſtrength; ſo that Maſſudi having never met with any opponent, was always ſure of ſucceſs, and thus came to be reckoned invincible.

113
He is defeated.

On the preſent occaſion, however, he experienced a prodigious reverſe of fortune. Naod having enjoined his ſoldiers to live in the ſame full and free manner during the faſt as at any other time, and having ſet the example himſelf, marched out againſt his enemy; who being ignorant of the precaution he had taken, advanced with his uſual confidence of ſucceſs. The Abyſſinian monarch, ſtill pretending fear, as if on account of the weakneſs of his men, pitched his camp in very ſtrong ground, but left ſome paſſages open to it, that the enemy might make an attack. This was done contrary to the advice of their leader; and the conſequence was, that almoſt every one of them was cut off. On this the king of Adel ſent ambaſſadors to ſolicit a continuance of the peace with himſelf; which was granted, upon condition that he reſtored all the ſlaves whom Maſſudi had carried off in his laſt year's expedition; with which the Mahometan chief thought proper to comply rather than engage in ſuch a dangerous war.

Naod having thus freed his country from the danger of any foreign invaſion, applied himſelf to the cultivation of the arts of peace, and reforming the manners of his ſubjects, in which he ſpent the remainder of his days. He died in 1508, after a reign of 13 years; and was ſucceeded by his ſon David III.

114
David III.

a child of 11 years of age. Though the affairs of the empire were at preſent in ſuch a ſtate as required a very prudent and active adminiſtration, the Empreſs Helena, widow of Bæda Mariam, had intereſt enough to get the crown ſettled on the infant juſt mentioned. This proceeded partly from her deſire of engroſſing all the power into her own hands, and partly from a wiſh to keep peace with Adel her native country. Theſe ends could not be accompliſhed but by keeping a minor on the throne of Abyſſinia; which was therefore her conſtant object as long as ſhe lived. But though this might not have been attended with any very bad conſequence had the two nations been left to decide the quarrel by themſelves, the face of affairs was now quite changed by the interference of the Turks. That people having now conquered almoſt the whole of Arabia to the Indian ocean, being likewiſe on the point of reducing Egypt, and having a great advantage over their adverſaries in uſing fire-arms, now projected the conqueſt of India alſo.

115
Abyſſinia in danger from the Turks.

In this indeed they were always diſappointed by the ſuperior valour of the Portugueſe; but as this conqueſt remained a favourite object with them, they did not abandon their attempts. All along the countries which they had conquered, they exacted ſuch enormous contributions from the merchants, that vaſt numbers of them fled to the African ſide of the Red Sea, and ſettled on the coaſt of Adel. The Turks, ſurpriſed at the increaſe of trade in this country, which they themſelves had occaſioned, reſolved to ſhare in the profits. For this purpoſe they took poſſeſſion of Zeyla, a ſmall iſland in the Red Sea, directly oppoſite to the coaſt of Adel; and erected a cuſtom-houſe in it, where they oppreſſed and ruined the trade as in other places. Thus both Adel and Abyſſinia were threatened with a moſt formidable enemy, which it would have been utterly out of their power to have reſiſted, had not the deſire of poſſeſſing India conſtantly prevented the Turks from directing their ſtrength againſt theſe countries. Helena was ſenſible enough of the dangerous ſituation of the empire, but preferred the gratification of her ambition to the good of her country; however, that ſhe might preſerve herſelf from the attacks of ſuch a formidable enemy, it was now thought proper to enter into an alliance with the Portugueſe. The ambaſſador from Portugal Peter Covillan, was denied the liberty of returning to his own country, as has been already related; and as, for ſome time paſt, it had not been obvious how he could be of much uſe, he had begun to fall into oblivion. The preſent emergency, however, recovered his importance. The empreſs was ſenſible of the neceſſity ſhe lay under of having ſome perſon who underſtood both the Abyſſinian and Portugueſe languages before ſhe could open any correſpondence with that nation, and who might likewiſe inform her of the names of the perſons to whom her letters ought to be addreſſed. By him ſhe was now inſtructed in every thing neceſſary to the ſucceſs of her embaſſy. The meſſage was committed to one Matthew an Armenian merchant, with whom a young Abyſſinian was joined; but the latter died by the way. The letters they carried are by Mr Bruce ſuppoſed to have been partly the work of Covillan and partly of the leſs experienced Abyſſinian confidents of the empreſs. They began with telling the king, that Matthew would give him information of her whole purpoſe, and that he might depend on the truth of what he ſaid; but in the latter part the whole ſecret of the embaſſy was diſcloſed, and a force ſufficient to deſtroy the Turkiſh power was expreſsly ſolicited. Among the other particulars of this embaſſy alſo it is ſaid, that a third part of Abyſſinia was offered in caſe her requiſitions were complied with; but this, as well as the embaſſy itſelf, was always denied by David when he came of age.

116
An embaſſy ſent to Portugal.

117
The ambaſſador ill uſed.

Matthew, tho' raiſed from the rank of merchant to that of an ambaſſador, could not, it ſeems, act according to his new dignity in ſuch a manner as to ſcreen himſelf from the moſt mortifying and dangerous imputations. Having arrived at Dabul in the Eaſt Indies, he was ſeized as a ſpy, but relieved by Albuquerque the viceroy of Goa; and that not out of any regard to his character as ambaſſador, but becauſe he himſelf had a deſign upon Abyſſinia. This viceroy uſed his utmoſt endeavours to induce Matthew to deliver his commiſſions to him; but the ambaſſador conſtantly refuſed to ſhow any letter he had, except to the king of Portugal in perſon, and in his own kingdom. This put him out of favour with the viceroy; while his attendants, diſpleaſed at the mean appearance of the man, inſiſted ſometimes that he was a ſpy from the ſultan, at others that he was a cook, an impoſtor, or a menial ſervant. Matthew, however, perceiving that he was now out of danger, maintained that his perſon was ſacred, and inſiſted on being treated as the repreſentative of a ſovereign. He let the viceroy, biſhop, and clergy know, that he had with him a piece of the wood of the true croſs, ſent as a preſent to the king of Portugal; and he required them, under pain of ſacrilege, to pay reſpect to the bearer of ſuch a precious relic, and to celebrate its arrival as a feſtival. This was inſtantly complied with, and a ſolemn proceſſion inſtituted; but very little regard appears to have been paid to this ambaſſador either in his temporal or ſpiritual character, as he could not obtain leave to depart for Portugal till 1513, which was three years after he arrived in India. In his paſſage he was extremely ill-treated by the ſhipmaſters with whom he ſailed: but of this they ſoon had cauſe to repent; as on their arrival at Liſbon they were all put in irons, and would probably have died in confinement, had not Matthew made interceſſion for them with the king.

118
Maſſudi news his depreda- tions wo than eve

In the mean time, Maſſudi having recovered from the defeat given him by Naod, and formed alliances with the Turks in Arabia, had renewed his depredations on the Abyſſinian territories with more ſucceſs than ever. Such a number of ſlaves had been, by his aſſiduity, ſent to Mecca, that he was honoured with a green ſilk ſtandard (an emblem of the true Mahometan faith), with a tent of black velvet embroidered with gold, and he was likewiſe made Sheykh of Zeyla; ſo that as this iſland was properly the key to the Abyſſinian empire, he could neither be rewarded with greater honour nor profit. This happened when David had attained the age of 16; and in conſequence of ſuch ſurpriſing ſucceſs, the king of Adel, never a hearty friend to Abyſſinia, determined to break the peace with that empire and make an alliance with Maſſudi. Having taken this reſolution, the two princes invaded Abyſſinia with their joint forces, and in one year carried off 19,000 Chriſtian ſlaves, ſo that a general terror was ſpread over the whole empire. David, already impatient of the injuries his people had ſuſtained, determined to raiſe an army, and to head it in perſon as his anceſtors had done, contrary to the advice of the empreſs, who, conſidering only his youth and inexperience in military affairs, wiſhed him to have employed ſome of his veteran officers. A very powerful army was raiſed, and ample ſupplies of all kinds were procured. With one part of his forces the emperor took the road to Auſſa the capital of Adel; ſending the other under the command of an officer named *Betwudet*, to meet the Mooriſh army, who were then ravaging part of Abyſſinia It was natural to be imagined, that the Moors, on hearing that an army was marching to deſtroy the capital of their country, would abandon the thoughts of conqueſt or plunder to preſerve it. In doing this, David knew that they had certain defiles to paſs before they could reach Adel. He ordered Betwudet therefore to allow them to enter theſe defiles; and before they could get through, he himſelf with the main body of the army, marched to attack them

119
David marches gainſt h

them at the other end. Thus the Moors were completely hemmed in by a ſuperior army: but beſides this unfavourable ſituation, they were farther diſpirited by Maſſudi.

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That hero came, on the morning of the engagement, to the king of Adel, informing him that his own time was now come; that he had been certainly told by a prophet, long ago, that if this year (1516) he ſhould fight the king of Abyſſinia in perſon, he ſhould loſe his life. He was aſſured that the Abyſſinian monarch was then preſent, having ſeen the ſcarlet tent which was uſed only by the ſovereigns of that country; and therefore adviſed the king of Adel to make the beſt of his way over the leaſt ſteep part of the mountain before the engagement began. The Adelian monarch, who had at any rate no great inclination to fight, was not inſpired with courage by this ſpeech: he therefore followed the advice given him; and, with a few of his friends, paſſed the mountain, leaving his troops to their fate. The Moors, in the mean time, being abandoned by one leader, and having another devoted to deſtruction, ſhowed an uncommon backwardneſs to engage, which was taken notice of by their enemies. Maſſudi, however, as ſoon as he ſuppoſed the king of Adel to be out of danger, ſent a trumpet to the Abyſſinian camp, with a challenge to any man of quality in the army to fight him; on condition that the party of the victorious champion ſhould be accounted conquerors, and that the armies ſhould immediately ſeparate without further bloodſhed. The challenge was inſtantly accepted by a monk named *Gabriel Andreas*; who, in the reign of Bæda Mariam, had been condemned to loſe the tip of his tongue for ſpeaking ſlightly of the king's proclamation of amneſty.

121 ſkilled.

Maſſudi ſhowed no reluctance to preſent himſelf; but received ſuch a ſtroke from his antagoniſt with a two-handed ſword as almoſt cut his body in two, and he immediately fell down dead. Andreas cut off his head; and throwing it at the king's feet, cried out, "There is the Goliath of the infidels." This became the ſignal for a general engagement, notwithſtanding the terms ſtipulated by Maſſudi before the combat.

122 Moors ated de- ed.

The Moors were quickly repulſed by the king's troops, and driven backward through the defile. At the other end they were met by the Betwudet (B), who drove them back to the king's forces; ſo that at laſt being forced to fly to the mountains, they were all ſlaughtered by the peaſants or periſhed with hunger and thirſt.

123 a ta- by the ugueſe.

The ſame day that this victory was gained over the Moors by David, being in the month of July 1516, the iſland of Zeyla in the Red Sea was taken and the town burnt by the Portugueſe fleet under Lopez Suarez de Alberguiera. The Abyſſinian ambaſſador, Matthew, in the mean time, had been received with the greateſt marks of eſteem in Portugal. The utmoſt attention was paid to his embaſſy; he was lodged in the moſt ſplendid manner; and his maintenance was ſuitable to his lodging.

123] aſſy the of ugal.

The king prepared an embaſſy on his part, and ſent home Matthew on board the Indian fleet commanded by Lopez. The ambaſſador ordered for Abyſſinia was one Edward Galvan, a man who had filled many ſtate departments with the utmoſt applauſe; but who by reaſon of his age, being now 86, was certainly very unfit for ſuch a diſtant and perilous voyage. He died accordingly on the iſland of Camaran in the Red Sea, where Suarez had imprudently landed, and paſſed the winter in the utmoſt diſtreſs for want of proviſions of every kind. This admiral was ſucceeded by Lopez de Seguyera; who ſailed firſt to the iſland of Goa in the Eaſt Indies, where he fitted out a ſtrong fleet; after which he returned to the Red Sea, and landed on the iſland of Maſſuah, having along with him Matthew, about the authenticity of whoſe miſſion there had been ſuch diſputes. At his firſt approach the inhabitants fled; but at laſt he was accoſted by a Chriſtian and a Moor from the continent, who informed him that the coaſt oppoſite to Maſſuah was part of the kingdom of Abyſſinia, and that it was governed by an officer named *Baharnagaſh*; that all the inhabitants of the iſland were Chriſtians; that the reaſon of their flying at the ſight of the Portugueſe fleet was that they took them for Turks, who frequently made deſcents, and ravaged the iſland, &c.

124 A Portugueſe fleet arrives on the coaſt of Abyſſinia.

The admiral diſmiſſed them with preſents; and ſoon after had a viſit from the governor of Arkeeko, a town on the continent; who informed him, that about 24 miles up the country there was a monaſtery, ſeven of the members of which were now deputed to wait upon him. Theſe inſtantly knew Matthew, and congratulated him in the warmeſt manner upon his return from ſuch a long voyage. An interview ſoon took place between the Baharnagaſh himſelf and Lopez. The Abyſſinian informed him, that the coming of the Portugueſe had been long expected, in conſequence of certain ancient prophecies; and that he himſelf and all the officers of the emperor were ready to ſerve him. They parted with mutual preſents; and all doubt about Matthew being now removed, he prepared to ſet out for the emperor's court; while Roderigo de Lima was nominated ambaſſador in place of Galvan who died. Along with them were 15 Portugueſe; all men of the moſt determined courage, and who would heſitate at nothing which they thought might contribute to the glory of their king, their own honour, or the advantage of their country.

125 Difficult journey of the ambaſſadors thro' Abyſſinia.

Their preſent journey indeed was much more perilous than their voyage from Portugal to Abyſſinia. The emperor was at this time in the ſouthern part of his dominions, but the Portugueſe had landed on the northern part; ſo that they had almoſt the whole breadth of the empire to paſs before they could meet with him. The very firſt journey they attempted was thro' a wood ſo thick that it could ſcarce afford a paſſage either to man or beaſt, while the interſtices of the trees were ſo interwoven with briers and thorns of various kinds, that their paſſage was rendered almoſt impracticable. This was rendered ſtill more terrible by the vaſt numbers of wild beaſts they ſaw, and which ſeemed only to be prevented from devouring them by the appearance of ſo many men together. The rainy ſeaſon was alſo now begun; ſo that they were expoſed to inceſſant deluges of water deſcending from the clouds, beſides frequent and violent ſtorms of wind, thunder and lightning, &c. To add to their misfortunes, an epidemic fever broke out among them, which

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(B) This is the title of one of the officers in Abyſſinia, not the proper name of a man.

126
Are very indifferently received by the emperor, and long detained.

which carried off Matthew and one of the ſervants of Don Roderigo. At laſt, after a moſt tedious and toilſome journey, from the 16th of April to the 18th of October 1520, the Portugueſe ambaſſador, with his retinue, came within ſight of the Abyſſinian camp at the diſtance of about three miles. His reception was by no means favourable; for inſtead of being immediately admitted to the preſence of the emperor, he was waited on by one of the officers of ſtate, ſtyled, in token of humility, *Hadug Ras*, or *commander of aſſes*; who cauſed him pitch his tent three miles farther off from the camp: and it was not till five years afterwards that he was enabled to finiſh the buſineſs of his embaſſy, and obtained leave to depart for Portugal.

127
At laſt allowed to depart with an ambaſſador from the emperor.

During all this time not a ſingle word had paſſed relating to the affairs of the two nations; ſo that it is difficult to imagine what might have been the deſign of the Abyſſinian emperor. At laſt, having reſolved to ſend an embaſſy to Portugal, he allowed Roderigo to depart, but detained two of his people, appointing Zaga Zaab, an Abyſſinian monk, his ambaſſador to Portugal.

128
Bad effects of this delay.

This long intercourſe betwixt two ſuch diſtant nations, however, could not but greatly alarm the Mahometan powers, who were natural enemies to both. Selim the Turkiſh ſultan, having been conſtantly defeated by the Portugueſe in the eaſt, and alarmed at the thoughts of having a fleet of that nation in the Red Sea, where they might greatly annoy his ſettlements on the coaſt of Arabia, determined to carry his arms to the African ſide; while the king of Adel, having ſtrengthened himſelf by alliances with the Turkiſh officers in Arabia, was now become a much more formidable enemy than before. This was ſoon experienced in a battle with the Adelians; in which the Abyſſinian monarch was overthrown with the loſs of almoſt all his great officers and principal nobility, beſides a vaſt number of private men. The victory was principally owing to the aſſiſtance given by the Turks; for the army was commanded by Mahomet ſurnamed *Gragné*, i. e. *left-handed*, governor of Zeyla which had now received a Turkiſh garriſon. This man, having the conqueſt of Abyſſinia greatly at heart, reſolved, as ſoon as poſſible, to effect ſomething deciſive; and therefore having ſent to Mecca all the priſoners taken in his late expedition, he obtained in return a conſiderable number of janizaries, with a train of portable artillery. Thus the fortune of the war was entirely decided in favour of the Adelians and Turks; the emperor was defeated in every battle, and frequently hunted from place to place like a wild beaſt. The Moors, finding at laſt no neceſſity for keeping up an army, over ran the whole empire in ſmall parties, every where plundering and burning the towns and villages, and carrying off the people for ſlaves.

129
The emperor defeated by the Moors.

130
The Adelians aſſiſted by the Turks

131
The emperor every where defeated and reduced to great diſtreſs.

This deſtructive war continued till the year 1537; when Gragné ſent a meſſage to the emperor, exhorting him not to fight any longer againſt God, but to make peace while it was in his power, and give him his daughter in marriage: on which condition he would withdraw his army; but otherwiſe he would reduce his empire to ſuch a ſtate that it ſhould be capable of producing nothing but graſs. David, however, ſtill refuſed to ſubmit; replying, that he put his confidence in God, who at preſent only chaſtiſed him and his people for their ſins; but that Gragné himſelf, being an infidel, and enemy to the true religion, could not fail of coming in a ſhort time to a miſerable end. This unſucceſsful negociation was followed by ſeveral encounters, in which the emperor was conſtantly defeated; in one of them his eldeſt ſon was killed, and in another his youngeſt was taken priſoner: ſo that he now ſeemed entirely deſtitute, being obliged to wander on foot, and all alone, hiding himſelf throughout the day among the buſhes on the mountains.

132
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The invincible conſtancy with which this forlorn monarch bore his misfortunes, proved a matter of ſurpriſe both to friends and enemies. Many of his veteran ſoldiers, compaſſionating the diſtreſſes of their ſovereign, ſought him out in his hiding places; ſo that he once more found himſelf at the head of a ſmall army, with which he gained ſome advantages that ſerved to keep up his own ſpirits and thoſe of his adherents. His greateſt enemy was Ammer, one of Gragné's officers, who headed the rebellious Abyſſinians, and who had formed a ſcheme of aſſaſſinating the king; but, inſtead of accompliſhing his purpoſe, he himſelf was aſſaſſinated in 1538 by a common ſoldier, on what account we are not informed.

By the death of Ammer and the ſmall ſucceſſes which David himſelf had obtained, the affairs of Abyſſinia ſeemed to revive; but ſtill there was no probability of their being ever brought to a fortunate iſſue. An embaſſy to Portugal was therefore thought of in good earneſt, as the miſchievous effects of ſlighting the proffered friendſhip of that power were now ſufficiently apparent. One of the attendants of Roderigo, named John Bermudes, who had been detained in Abyſſinia, was choſen for this purpoſe; and to his temporal character of ambaſſador was added that of Abuna, primate or patriarch. John, who was not a clergyman originally, had received all the inferior eccleſiaſtical orders at once, that the ſupreme one might be thus conferred upon him; but happening to be a great bigot to the popiſh religion, he would not accept of his new dignity but with a proviſo, that his ordination ſhould be approved by the pope. This was indirectly ſubmitting the church of Abyſſinia to that of Rome; to which David would never have agreed, had it not been for the deſperate ſituation of his affairs at that time. John was therefore allowed to do as he thought proper: when paſſing through Arabia and Egypt to Italy, he had his ordination confirmed by the pope; after which he ſet out on the buſineſs of his embaſſy. On his arrival at Liſbon, he was acknowledged by the king as patriarch of Alexandria, Abyſſinia, and of the ſea; for this laſt title had alſo been conferred upon him by his Holineſs. Entering then upon the purpoſe of his embaſſy, he began by putting Zaga Zaab in irons for having waſted ſo much time, and done nothing effectual ſince he had left Abyſſinia. Then he repreſented to the king the diſtreſſes of the Abyſſinians in ſuch a ſtrong light, and inſiſted ſo violently for relief to them, that an order was very ſoon procured for 400 muſketeers to be ſent by Don Garcia de Noronha to their relief. To accelerate the progreſs of the intended ſuccours, John him-

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himſelf propoſed to ſail in the ſame fleet with Don Garcia; but his voyage was delayed for a whole year by ſickneſs, occaſioned, as he ſuppoſed, by poiſon given him by Zaga Zaab, the monk whom he had impriſoned, and who had been ſet at liberty by the king. After his recovery, however, he ſet ſail for India, where he arrived in ſafety. The death of Don Garcia, which happened in the mean time, occaſioned another delay; but at laſt it was reſolved that Don Stephen de Gama, who had ſucceeded to Don Garcia, ſhould undertake an expedition to the Red Sea, in order to burn ſome Turkiſh galleys which then lay at Suez. But intelligence having in the mean time been received of the intended voyage, theſe veſſels had withdrawn themſelves. Anchoring then in the port of Maſuah, Don Stephen ſent over to Arkeeko on the continent to procure freſh water and other proviſions; but the Turks and Moors being now entirely maſters of that coaſt, the goods he had ſent in exchange were ſeized without any thing being given in return. A meſſage was brought back, importing, that the king of Adel was now maſter of all Ethiopia, and conſequently that no trade could be carried on without his leave; but if Don Stephen would make peace with him, the goods ſhould be reſtored, a plentiful ſupply of water and all kinds of proviſions granted, and amends likewiſe made for 60 Portugueſe who had been killed at Zeyla. Theſe had run away from the fleet on its firſt arrival in the Red Sea, and landed on the coaſt of Adel, where they could procure no water; of which the barbarians took advantage to decoy them up the country; where, having perſuaded them to lay down their arms, they murdered them all. To this Don Stephen returned a ſmooth anſwer, ſent more goods, obtained proviſions, and promiſed to come aſhore as ſoon as a Mahometan feſtival, which the ſavages were than celebrating, ſhould be over. This treaty was carried on with equal bad faith on both ſides; but Don Stephen had now the advantage by obtaining the proviſions he ſtood in need of. Theſe were no ſooner brought on board, than he ſtrictly forbad all intercourſe with the land; and chooſing out 600 men, he attacked the town of Arkeeko, killed the governor, and ſent his head to the Abyſſinian court; maſſacring at the ſame time all the people in the town he met with.

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During this long interval a conſiderable change had taken place in the Abyſſinian affairs. We have already ſeen that David had been reduced to great diſtreſs; but afterwards met with ſome little ſucceſſes, which ſeemed to indicate an approaching change of fortune. In theſe, however, he was ſoon diſappointed. A Mahometan chief called *Vizir Mugdid* made an attack upon the rock Geſhen, where the royal family were kept; and finding it entirely unguarded, aſcended without oppoſition, and put every perſon to the ſword. This laſt diſaſter ſeems to have been too great for the reſolution even of this heroic prince, as he died the ſame year 1540. He was ſucceeded by his ſon Claudius, who, though then but about 18 years of age, was endowed with all the great qualities neceſſary for managing the affairs of the empire in ſuch a dreadful criſis, and had made conſiderable progreſs before the arrival of the Portugueſe.

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139
Powerful league formed againſt the new emperor.

140
The Moors defeated.

On his acceſſion, the Moors deſpiſing his youth, inſtantly formed a league among themſelves to cruſh him at once; but, like almoſt all others too confident of victory, they neglected to take the proper precautions againſt a ſurpriſe. This was not unobſerved by Claudius; who falling upon one party which lay next to him, gave them a total defeat. The king purſued them the whole day of the engagement, the enſuing night, and part of the following day; putting to death without mercy every one who fell into his hands. This exceſſive ardour very much damped the ſpirits of his enemies, and at the ſame time inſpired his own party with the moſt ſanguine hopes of ſucceſs; whence he ſoon appeared at the head of ſuch an army as convinced his enemies that he was by no means to be deſpiſed. They now found it neceſſary to deſiſt from the practice they had ſo long continued of plundering and ravaging the country; to call in their ſcattered parties, unite their troops, and ſpend the rainy ſeaſon in ſuch parts of Abyſſinia as they had conquered, without returning into Adel as had hitherto been uſual with them. They now came to a reſolution to force the king to a general engagement, in which they hoped to prove victorious by dint of numbers. For this purpoſe all the rebel chiefs in Abyſſinia were called in, and a formidable army collected. They waited only for one very experienced chief named *Jonathan*; after whoſe junction they determined to attack the royal army without delay. But Claudius took his poſts at all times with ſuch judgment, that any attempt upon his camp would have been almoſt deſperate; and getting intelligence where Jonathan lay with his forces, he marched out in the night time, came upon him quite unprepared, defeated and killed him, ſending his head to the reſt of the confederacy by a priſoner, the only one he had ſpared out of all thoſe who were taken. By the ſame meſſenger a defiance was ſent to the Moors, and many opprobrious epithets were beſtowed upon them; but though the armies approached one another, and continued for ſeveral days under arms, the Moors were ſo much intimidated that they would by no means venture an engagement.

141
Jonathan, a rebel chief, defeated and killed.

142
Unſucceſsful attempt to aſſaſſinate Claudius.

By this victory the ſpirits of the Abyſſinians were ſo much elevated, that they flocked in from all parts to join their prince; and even many of the Mahometans, having experienced the lenity of the Chriſtian government, choſe rather to ſubmit to Claudius than to the Turks and Adelians. The king, however, was in danger of being aſſaſſinated by one Ammer, a treacherous governor; who knowing that he had retired to ſome diſtance from his army to celebrate the feſtival of Eaſter, attempted to ſurpriſe him when almoſt deſtitute of attendants; but Claudius having timely notice of his deſigns, laid an ambuſh for him with a conſiderable part of his army which he headed in perſon. The rebel, not being equally well informed, fell into the ſnare, was defeated, and almoſt his whole army cut off on the 24th of April 1541.

Matters were in this ſituation when the Portugueſe arrived, as has already been related. The head of the governor of Arkeeko had been received by the queen, who conſidered it as an happy inſtance of the valour of her allies, and as a preſage of future victories. The Portugueſe admiral, Don Stephen de Gama, loſt no time in employing the men allowed by the king to aſſiſt

aſſiſt the Abyſſinians. Theſe were in number 450; but as the officers who commanded them were all noblemen of the firſt rank, the army was conſiderably increaſed by the number of their ſervants. The ſupreme command was given to Don Chriſtopher de Gama the admiral's youngeſt brother. Almoſt every man on board, however, was ambitious to ſhare in the glory of this enterpriſe; whence great complaints were made by thoſe who were not allowed to go: and hence, Mr Bruce informs us, the bay in the iſland of Maſua, where the admiral's galley rode, had the name of *Bahia dos Agravados;* the bay of the *injured*, not of the *ſick*, as has been erroneouſly ſuppoſed.

143 Derivation of the name of a bay in Maſuah.

144 The Portugueſe under Don Chriſtopher de Gama ſet out to meet the emperor.

This gallant army inſtantly ſet forward by the moſt eaſy road through the Abyſſinian territories, in order to join the emperor. Still, however, the way was ſo rugged, that the carriages of their artillery gave way, and they were therefore obliged to conſtruct new ones as they went along, ſplitting the barrels of old muſkets to furniſh them with iron, that commodity being very ſcarce in Abyſſinia. In this journey the general was met by the empreſs, attended by her two ſiſters and a great many others of both ſexes, whom he ſaluted with drums beating and colours flying, accompanied by a general diſcharge of the fire-arms, to their great confuſion and terror. Her majeſty, whoſe perſon was entirely covered, indulged the Portugueſe general with a view of her face; and after a mutual exchange of civilities, the queen returned with 100 muſketeers appointed by him as her guard. After eight days march, through a very rugged country, Don Chriſtopher received a defiance in very inſulting terms from Gragné the Mahometan general, which was returned in the ſame ſtyle. An engagement took place on the 25th of March 1542; in which little was done by either party beſides wounding both the commanders: however, Gragné, though greatly ſuperior in horſe, had already felt ſo much of the Portugueſe valour, that he did not chooſe to venture a ſecond battle.

145 Interview with the empreſs.

146 Battle between the Portugueſe and the Moors.

As the ſeaſon was now far advanced, the Portugueſe put themſelves into winter-quarters; while Gragné remained in their neighbourhood, in hopes of forcing them to a battle before they could be joined by the king, who advanced for the purpoſe as faſt as poſſible. This being the caſe, it was to the laſt degree imprudent in Don Chriſtopher to think of venturing an engagement without previouſly forming a junction with his royal ally; eſpecially as Gragné had now doubled the number of his horſe, increaſed his train of artillery, and otherwiſe received conſiderable reinforcements. Unfortunately, however, the Portugueſe general ſuffered himſelf to be hurried away by the impetuoſity of his own temper; and paying regard to the defiances and reproaches of a barbarian whom he ought to have deſpiſed, was induced, contrary to all advice that could be given, to venture an engagement at a vaſt diſadvantage. Yet when the armies encountered each other, the ſuperiority of the Portugueſe was ſo great, that victory ſeemed likely to be decided in their favour. On this Gragné ordered ſome artillery to be pointed againſt the Abyſſinian allies. Theſe, entirely unaccuſtomed to fire-arms, fled almoſt at the firſt diſcharge. Gragné, well knowing that it was his intereſt to deſtroy the Portugueſe, who were only 400 in number, ordered no purſuit againſt the Abyſſinians, but fell with his whole force upon the Europeans. Even yet his ſucceſs was doubtful, till Don Chriſtopher, expoſing himſelf too much, was ſingled out and ſhot through the arm. This produced ſuch confuſion, that a total defeat, with the loſs of the camp, enſued; when the barbarians, according to cuſtom, put to death all the wounded, and began to abuſe the women, who had all retired into the tent of the general. This being obſerved by a noble Abyſſinian lady married to one of the Portugueſe, ſhe ſet fire to ſome barrels of gunpowder which happened to be in the tent, and thus periſhed along with her raviſhers.

147 Don Chriſtopher raſhly engages at a diſadvantage.

148 Is wounded and defeated.

Don Chriſtopher, who by his raſhneſs had occaſioned this diſaſter, obſtinately refuſed to fly, till he was put into a litter by force, and ſent off along with the queen and patriarch, who happened to be preſent. The two latter had ſet off before the battle; but Don Chriſtopher ſent ſome horſemen in purſuit of them, by whom they were brought back, and reproached by the general for the bad example they had ſhown to the army. Arriving at the approach of night in a wood where there was a cave, Don Chriſtopher entered it to have his wound dreſſed, but obſtinately refuſed to proceed farther. Next day he was taken; betrayed, as is moſt probable, by a woman whom he loved; who is ſaid to have pointed out this cave to him, and promiſed to ſend ſome friends to convey him into a place of ſafety. Inſtead of this, a party of the enemy entered the cave; and on his readily informing them of his name, they inſtantly carried him in triumph to Gragné. Here, after ſeveral inſults had paſſed on both ſides, the barbarian, in a fit of paſſion, cut off his head; which was ſent to Conſtantinople, and his body cut in pieces and diſperſed through Abyſſinia.

149 Takes ſhelter in a cave, is taken and put to death.

This cruelty of Gragné proved more detrimental to his cauſe than a complete victory gained by the other party could have been. On the one hand, the Portugueſe were ſo exaſperated by the loſs of their leader, that they were ready to embark in the moſt deſperate undertakings, in order to revenge his death; on the other, the Turks, on whom he principally depended, were irritated to the laſt degree at the diſappointment of ſharing his ranſom, which they imagined would have been an immenſe ſum; and therefore abandoned their leader to return to their own country. Gragné, thus left to decide the quarrel with his Africans, was quickly defeated by Claudius; and in another engagement which took place on the 10th of February 1543, his troops were defeated and himſelf killed. This laſt misfortune was owing to his boldneſs in advancing before his army which was giving way, ſo that he became known to the Portugueſe. On this he was ſingled out by a Portugueſe named *Peter Lyon*, who had been valet de chambre to Don Chriſtopher. This man, to make his aim more ſure, crept for a conſiderable way along the bank of a river towards the place where Gragné was; and when come ſufficiently near, ſhot him quite through the body. Finding himſelf mortally wounded, he quitted the field of battle; and was followed by Lyon, who in a ſhort time ſaw him fall from his horſe. He then came up to him, and cut off one of his ears, which he put in his pocket, and returned to the battle to do what further ſervice he could. The next day Gragné's body was found by an Abyſſinian officer, who cut off his head and claimed the merit of killing him; but Lyon having pulled

150 Gragné abandoned by his allies, is defeated and killed.

out the ear which he carried in his pocket, vindicated his own right to the reward which was to be given to the other. On this occaſion the Mooriſh army was almoſt entirely deſtroyed; Gragné's wife and ſon were taken priſoners, with Nur the ſon of Mugdid, who deſtroyed the royal family; and it had been happy for Claudius, as we ſhall afterwards ſee, that he had put theſe priſoners to death. Very ſoon after this engagement, the emperor had intelligence that Joram, a rebel chief, who had once reduced his father David to great diſtreſs, was advancing rapidly in hopes of being ſtill able to be preſent at the battle. This was the laſt of his father's enemies on whom Claudius had to revenge himſelf; and this was effectually done by a detachment of his army, who poſted themſelves in his way, fell upon him unexpectedly, and cut him in pieces with all his men.

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Claudius being now freed from all apprehenſion of foreign enemies, began to turn his thoughts towards the reparation of the damages occaſioned by ſuch a long war, and the ſettlement of religious affairs. We have already mentioned, that John Bermudes was appointed by the pope, as he ſaid, patriarch of Alexandria, Abyſſinia, and of the ſea. This, however, is ſaid by others to have been a falſehood; that John was originally ordained by the old patriarch of Abyſſinia; and that the pope did no more than give his ſanction to this ordination, without adding any new one of his own. But whether this was ſo or not, certain it is, that John, who was very inſolent in his behaviour, and of a turbulent diſpoſition, now began to inſiſt that Claudius ſhould not only embrace the doctrines of the church of Rome, but eſtabliſh that religion throughout the empire, which he ſaid his father David had engaged to do; and which, conſidering the extreme diſtreſs in which he was involved, it is very probable that he did. Claudius, however, was of a different opinion, and refuſed to alter the religion of the country; upon which a contention began, which was not ended but by the total expulſion of the catholics, and the cutting off all communication with Europeans. At that time the Portugueſe and Abyſſinians intermarried, and attended religious worſhip promiſcuouſly in each others churches: ſo that the two nations might have continued to live in harmony, had it not been for the miſbehaviour of Bermudes. Claudius, perceiving the violence and overbearing diſpoſition of the man, took every opportuninty of ſhowing his attachment to the Alexandrian or Greek church; denying that he had made any promiſe of ſubmitting to the ſee of Rome. On this Bermudes told him that he was accurſed and excommunicated; the king in return called him a Neſtorian heretic; to which Bermudes replied by calling him a liar, and threatened to return to India, and carry all the Portugueſe along with him. To this inſolent ſpeech Claudius anſwered, that he wiſhed indeed that Bermudes would return to India; but that he would not allow the Portugueſe, nor any perſon, to leave his territories without permiſſion.

153
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Thus matters ſeemed likely to come to an open rupture; and there can be no doubt that the worſt extremities would have followed, had not the emperor been reſtrained by the fear of the Portugueſe valour on the one hand if he ſhould attempt any thing againſt them, and the hopes of further advantages ſhould he retain them in his ſervice. For theſe reaſons he bore with patience the inſults of the patriarch; attempting to gain the reſt of the Portugueſe over to his ſide. He ſucceeded perfectly with their commander Arius Dias; who privately renounced the church of Rome, and was baptized into that of Abyſſinia by the name of *Marcus* or *Marco*; in conſequence of which, the emperor, looking upon him as a naturalized ſubject, ſent him a ſtandard with the Abyſſinian arms to be uſed inſtead of thoſe of Portugal. This, however, was not delivered; for a Portugueſe named *James Brito*, meeting the page who carried it, took it from him and killed him with his ſword. The apoſtacy of Arius is ſaid to have been owing to the great honours which had been conferred upon him by the Abyſſinian monarch: for having, in an expedition againſt Adel, defeated and killed the king and taken the queen priſoner, he beſtowed her in marriage on Arius; and that the match might be equal, he raiſed him alſo to the royal dignity, by giving him the kingdoms of Doar and Belwa.

154
The Portugueſe command-er renounces the Romiſh religion.

155
He is inveſted with royal dignity.

The altercation on the ſubject of religion becoming every day more violent, Bermudes was prohibited by the emperor from ſending any farther orders to the Portugueſe, they being now under the command of Marco the Abyſſinian captain-general; meaning Arius Dias, to whom the name of Marco had been lately given. To this the patriarch replied, that being ſubjects of the king of Portugal, they were under no obligation to obey a traitor to his king and religion; and that ſince his majeſty ſtill perſiſted in refuſing to ſubmit to the pope, he was reſolved to leave the empire with his forces. The emperor, however, ſtill inſiſted that he was abſolute in his own dominions; and he expected the Portugueſe to pay obedience to his general, and none elſe. The Portugueſe, enraged at this declaration, reſolved to die ſword in hand rather than ſubmit to ſuch terms; and therefore began to fortify their camp in caſe of any attack. The emperor, on this, thinking a defiance was given him in his own territories, ordered the camp to be inſtantly attacked. The attempt was accordingly made, but with very little ſucceſs; the Portugueſe having ſtrewed the ground with gunpowder, ſet fire to it as the Abyſſinians marched along, which deſtroyed great numbers, and intimidated the reſt to ſuch a degree that they inſtantly fled. Finding it vain to think of reducing them by force, the emperor is then ſaid to have been adviſed by Marco to conſult his own ſafety, and break the power of the Portugueſe by artifice. With this view he ſent for the patriarch, pretended to be very ſorry for his frequent breach of promiſe, and deſirous to make what amends for it he could. Inſtead of complying with the patriarch's demands, however, he firſt ordered his ſubjects to ſupply them with no proviſions: then he ſtopped the mouths of the Portugueſe by a conſiderable quantity of gold, giving the patriarch himſelf a very valuable preſent; adding to all this a large ſupply of proviſions; but at the ſame time taking proper methods to diſperſe their leaders into different parts of the empire, ſo that they ſhould find it impoſſible ever to reunite in a body.

156
Hoſtilities betwixt the Abyſſinians and Portugueſe.

Such is the account given of this tranſaction by the Portugueſe hiſtorians; but that of Mr Bruce, who ſays that he tranſlated his from the Abyſſinian annals, is ſomewhat different. He only informs us, that the quarrel betwixt the Portugueſe and Abyſſinians was inflamed by the "incendiary ſpirit of the brutiſh Bermudes: from

from reproaches they came to blows; and this proceeded ſo far, that one night the Portugueſe aſſaulted the king's tent, where they ſlew ſome and grievouſly wounded others." The event, however, was, that no abſolute quarrel ever took place betwixt this emperor and any of the Portugueſe excepting this patriarch, whom he was on the point of baniſhing to one of the rocks uſed as priſons in Abyſſinia. This was diſpenſed with on the interpoſition of Gaſpar de Suza the new Portugueſe commander (who had ſucceeded Arius Dias), and another named *Kaſmati Robel*, both of whom were in great favour with the emperor; and Bermudes perſuaded to withdraw to India.

157 Bermudes leaves Abyſſinia.

According to Mr Bruce, he repaired to Dobarwa, where he remained two years quite neglected and forlorn, ſaying maſs to no more than ten Portugueſe who had ſettled there after the defeat of Don Chriſtopher. He then went to Maſuah; and the wind ſoon becoming favourable, he embarked in a Portugueſe veſſel, carrying with him the ten perſons to whom he had officiated as prieſt. From Goa he returned to Portugal, and continued there till his death. On the other hand, the Portugueſe writers inform us, that he was narrowly watched by order of the emperor; and that Gaſpar de Suza, the Portugueſe commander, had orders to put him to death if he ſhould attempt to make his eſcape. Bermudes, however, being determined at all events to make his eſcape, pretended to be ill of the gout, and that a change of air was neceſſary for his recovery; for which reaſon he went to the town above mentioned, where there was a monaſtery. On this pretence he was allowed to croſs the kingdom of Tigré, accompanied by eight faithful ſervants, with whom he reached Dobarwa unſuſpected. Here he remained concealed in a monaſtery for two years before he could find an opportunity of getting to the iſland of Maſuah, from whence he proceeded to Goa.

158 A new deputation from the pope.

The emperor was ſcarce freed from this troubleſome prieſt, when he was in danger of being involved in new difficulties by the intruſion of others into his dominions. Ignatius Loyola, founder of the order of the Jeſuits, was at that time at Rome; and ſo much attached to the cauſe of the Pope, that he propoſed to go in perſon to Abyſſinia, in order to make a thorough converſion of both prince and people. His Holineſs, however who, from what he had already ſeen of Ignatius, conceived that he might be of greater uſe to him by ſtaying in Europe, ſent in his ſtead Nugnez Baretto, one of the ſociety of Jeſuits, whom he inveſted with the dignity of patriarch, and honoured with a letter to Claudius. With theſe commiſſions, and a number of prieſts, Baretto ſailed for Goa in the Eaſt Indies; by which, however diſtant, the only paſſage to Abyſſinia was at that time. On his arrival at that place he was informed that the Abyſſinian monarch had ſuch a ſteady averſion to the church of Rome, that there was no probability of his meeting with a favourable reception. For this reaſon it was judged more proper to ſend ſome clergymen of inferior dignity, with proper credentials, as ambaſſadors to the emperor from the governor of India, without running the riſk of having any affront put upon the patriarch. Theſe were Oviedo biſhop of Hierapolis, Carneyro biſhop of Nice, and ſeveral others, who arrived ſafely at Maſuah in the year 1558. Claudius, on hearing of their arrival, was greatly pleaſed, as ſuppoſing that a new ſupply of Portugueſe ſoldiers were arrived. Finding, however, that they were only prieſts, he was very much mortified, but ſtill reſolved to give them a civil reception. But a more important conſideration, and which concerned the welfare of the empire in the higheſt degree, now claimed his attention. This was the appointment of a ſucceſſor to the throne, Claudius himſelf having no ſon.

159 Prince Menas redeemed from captivity.

A project was therefore ſet on foot for ranſoming Prince Menas, the emperor's youngeſt brother, who had been taken priſoner by the Moors in the time of David, and hitherto detained in captivity on a high mountain in Adel. This was not likely to be accompliſhed; for the Moors would not willingly part with one who they knew was their mortal enemy, that he might be raiſed to the ſovereignty of a great empire. By detaining him priſoner alſo, they might reaſonably hope for diſputes concerning the ſucceſſion to the Abyſſinian throne; which would enable them to attack the empire with advantage. In theſe circumſtances, it is probable that Claudius would have found great difficulty in procuring his brother's liberty, had it not been that the ſon of the famous Gragné had been taken in that battle in which his father was killed, and in like manner confined on a mountain in Abyſſinia. A propoſal was then made to his mother, who had eſcaped into Atbara that her ſon ſhould have his liberty, provided the king's brother ſhould be reſtored. This was accepted; and by means of the baſhaw of Maſuah, an exchange was made. Four thouſand ounces of gold were given for the ranſom of Menas, which were divided between the Moors and the baſhaw of Maſuah; while on his part Claudius ſet at liberty Ali Gerad the ſon of Gragné without any farther demand.

According to Bermudes's account of theſe times, the widow of Gragné was taken priſoner at the battle in which her huſband was killed, and was afterwards married to Arius Dias. In this caſe we muſt ſuppoſe her to have been the ſame with the *queen of Adel*, mentioned as his conſort by other hiſtorians: but Mr Bruce treats this account as a mere fable; and informs us, that by means of Nur the ſon of Mugdid, murderer of the royal family as already related, ſhe made her eſcape into Atbara.

160 Nur determines to deſtroy Claudius.

On that occaſion Nur fell in love with her; but ſhe refuſed to marry any man unleſs he brought her the head of Claudius, who had killed her former huſband. To attain his wiſhes therefore, Nur, now governor of Zeyla, undertook the taſk; and when Claudius marched towards Adel, ſent him a challenge to fight; telling him that there was yet a particular inſtrument for ſhedding the blood of the Abyſſinian princes, and deſiring him to be prepared, as he was very ſoon to ſet out to attack him. The emperor did not decline the combat, but is ſaid to have been adviſed againſt this expedition by all his friends. This advice ſeems to have proceeded from a number of prophecies, probably trumped up by the clergy, that he ſhould be unfortunate, and loſe his life in the campaign. Theſe prophecies ought no doubt to have had weight with him, as they moſt certainly indicated a ſpirit of diſaffection among his troops; and the event accordingly evinced that it was ſo.

161 Defeat an death of t emperor.

The Abyſſinians fled almoſt on the firſt fire, leaving the king in the midſt of his enemies, attended only by 18 Portugueſe and 20 horſemen of Abyſſinia, who continued faithful to the laſt.

All theſe were killed after the moſt deſperate reſiſtance; the king himſelf receiving upwards of 20 wounds before he fell. His head was cut off, and brought by Nur to his miſtreſs, who hung it up on a tree before her door. Here it remained for three years, when it was at laſt bought by an Armenian merchant, who buried it at Antioch in the ſepulchre of a ſaint of the ſame name. Nur gained on this occaſion a very complete victory; the king and moſt of the principal nobility being killed, a great number made priſoners, and the camp taken with an immenſe booty. On his return to Adel, he refuſed to accept of any congratulations, or to allow rejoicings to be made for his victory, but paſſed along in the habit of a common ſoldier mounted on an aſs; ſaying, that he owed the victory to the mercy of God alone, who had immediately interpoſed for the deſtruction of the Chriſtian army.

162
eign of
enas.

This fatal engagement took place on the 22d of March 1559; and as the ſucceſſion had been already ſettled, Menas aſcended the throne without any oppoſition. On his acceſſion he found his affairs in great confuſion, and he had ſtill to contend with foreign and domeſtic enemies The firſt of theſe was Radaet the king of the Jews, who had a territory in the empire of Abyſſinia. the capital of which was on a rock named *Samen*. The cauſe of this quarrel is not known, but the event was unfortunate; the king being obliged to abandon the enterpriſe, after having beſtowed a conſiderable time upon it. This was followed by an attempt to aſſaſſinate him, which had very near taken place; and this again by a conſpiracy among his principal nobles headed by Iſaac the Baharnagaſh.

163
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He had been a very faithful ſervant of the late emperor Claudius; but ill uſed by Menas, who was of a very haughty and moroſe diſpoſition. In attempting to ſuppreſs this rebellion, the firſt attempts of the emperor were likewiſe ineffectual, his forces being attacked by ſurpriſe and entirely defeated. Soon after this, Iſaac proclaimed Taſcar the nephew of Menas, who was then at liberty, king of Abyſſinia; hoping thereby to ſtrengthen his cauſe, and enable him to cope with the emperor, who was aſſembling a powerful army againſt him.

164
e is de-
eated.

This expedient did not anſwer the purpoſe. His army was entirely defeated by Menas; Taſcar taken priſoner, and thrown headlong from the top of a precipice; and Iſaac himſelf eſcaped with great difficulty to the confines of his own government in the neighbourhood of Maſuah.

165
Allies with
he Turks
nd Portu-
ueſe.

Here he entered into an alliance with the Turkiſh baſhaw of Maſuah; whoſe friendſhip he gained by putting him in poſſeſſion of the town of Dobarwa, with the flat country adjacent, which abounds with the proviſions wanted at Maſuah, and is looked upon as the key to the province of Tigre and the high-lands of Abyſſinia. Beſides this, Iſaac ſtrengthened himſelf alſo by an alliance with the Portugueſe; which, had their numbers been at all conſiderable, muſt have been very formidable. Their inclination to deſert their former protector and ally the emperor, proceeded entirely from the ſhameful behaviour of their prieſts, who never would be ſatisfied without enſlaving the emperor as well as his ſubjects to the tyranny of Rome.

166
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el with the
mperor.

We have already ſeen that Bermudes had proceeded ſo far on this ſubject, that he narrowly eſcaped with his life. His ſucceſſor Oviedo (for the patriarch Nugnez died by the way) fared ſtill worſe. On his introduction to the emperor Claudius, he informed him, that the pope and king of Portugal now expected no leſs than an immediate fulfilment of his engagements of ſubmiſſion to the ſee of Rome. This requiſition was made with ſuch an air of inſolence, that the prince could ſcarce conceal his reſentment; but reſtraining his paſſion, he promiſed to conſider of it, and to call meetings of the learned in theſe matters to debate the point. This was a very fruitleſs taſk; and therefore Oviedo thought proper to quit the court towards the end of December 1558; leaving behind him an inſolent letter addreſſed to the Portugueſe and ſuch converts as they had made; in which he exhorted them not to converſe with ſchiſmatics, and the Abyſſinians to forſake their errors. Being now debarred from acceſs to the emperor, he began to entertain the people with ſeditious diſcourſes; which practice he continued during the remaining part of the reign of Claudius and the beginning of that of Menas. The latter, perceiving the pernicious tendency of his diſcourſes, poſitively commanded him to deſiſt; which the patriarch refuſing, the emperor fell upon him with his own hands, beat him ſeverely, tore his clothes and beard. and took his chalice from him that he might thus be diſabled from ſaying maſs; after which he baniſhed him, with Francis Lopez another of his aſſociates, to a barren mountain, where they remained ſeven months in great miſery.

167
Oviedo baniſhed to a
mountain.

Not content with this, he iſſued many ſevere edicts againſt the Portugueſe; prohibited them from intermarrying with the Abyſſinians; and ſuch of the Abyſſinian women as were already married to Portugueſe huſbands, he commanded not to accompany them to their churches. His next ſtep was to call Oviedo again into his preſence, and command him, under pain of death, inſtantly to leave his dominions.

168
Is commanded to
leave the
empire,
but refuſes.

The inſolent and fooliſh prieſt refuſed obedience to this expreſs command; he declared that he would obey God rather than man; and preſenting his bare neck to the emperor, deſired him to ſtrike and put an end to his life at once Menas drew his ſword, but was prevented by the queen and others who ſtood near him from giving the fatal ſtroke. A ſecond beating and baniſhment to the mountain ſucceeded; and in the latter part of the ſentence all the Portugueſe prieſts as well as others were included.

169
Sentence of
baniſhment
paſſed on all
the Portugueſe, who
thereupon
join the
rebels.

The Portugueſe, however, determined not to ſubmit to ſuch an indignity; and therefore, to a man, joined Iſaac; who, in expectation of more auxiliaries from India, profeſſed a great deſire of embracing the Romiſh religion The king was very apprehenſive, and not without reaſon, of the arrival of more Portugueſe; but it appears that Oviedo had not ſufficient intereſt to procure the ſupply he promiſed. An engagement, therefore, took place without them, in which Menas was again victorious; though the battle was not ſo deciſive as to put an end to the rebellion.

170
Iſaac again
defeated.

The emperor died a ſhort time after his victory, and was ſucceeded in 1563 by his ſon Sertza Denghel, then only 12 years of age.

171
Reign of
Sertza
Denghel.

The beginning of his reign was diſturbed by new rebellions; which, however, were happily ſuppreſſed. Iſaac, with his allies the baſhaw and the Portugueſe, ſeem to have remained for ſome time unmoleſted; and in the year 1569, a kind of accommodation took place. It is by no means eaſy to ſay how the Portugueſe were again received into favour after ſuch flagrant treachery and rebellion. Mr Bruce.

Bruce only ſimply tells us that "Oviedo and the Portugueſe did not appear at court." This indeed is not to be wondered at, as they had been ſo lately at open war with the emperor. Other accounts ſay, that after the laſt battle with Iſaac, "their name became ſo odious to all the Abyſſinians, eſpecially to their monarchs, that they would never ſuffer any of them to be in their army from that time." Some of theſe accounts ſay alſo, that Menas was defeated and killed in another battle; others, that he was driven to ſome high mountains, where he wandered about till death put an end to his miſery. Accounts of this kind, however, are by Mr Bruce treated as mere falſehoods, and expreſsly contradictory to the annals of thoſe times. All we can ſay upon the ſubject therefore is, that after the defeat of Iſaac, the Portugueſe, not excepting Oviedo himſelf, remained in Abyſſinia, where they were more favourably dealt with by the new emperor than they had been by his father; though he was no friend to their religion, as ſuppoſing it to be deſtructive of monarchy and all civil government. It is probable alſo, that the various diſturbances which happened, together with his own tender age during the beginning of his reign, would prevent him from paying that attention to them which he would otherwiſe have done. The Galla, a very barbarous nation, and who have at laſt greatly reduced the power of the Ethiopian monarchs, made frequent inroads during this reign; and in the year 1576, a league was formed by Mahomet king of Adel, with Iſaac and the Turkiſh baſhaw, who had either continued their hoſtilities, or renewed them about this time.

172
Iſaac and the Baſhaw league with the king of Adel;

The emperor, however, marched with ſuch expedition, that he did not allow them time to join their forces; and attacking them ſeparately, gained a complete victory over them all.

173
But are entirely defeated.

Almoſt the whole Mooriſh army was deſtroyed; but while the emperor entered Adel with a deſign to make a full end of his enemies on the eaſt, he received information that the Galla had invaded him on the weſt. Traverſing the whole breadth of the empire therefore with the utmoſt expedition, he came up with theſe enemies, who were afraid to encounter him. On this he turned his arms againſt the Falaſha, obliging them to deliver up their king, whom he baniſhed to a mountain.

174
The emperor invades and ravages the country of the Galla and Falaſha.

Then invading the country of the Galla and Falaſha, he ravaged it for four years ſucceſſively, protecting at the ſame time the kingdom of Narea from the inroads of theſe barbarians.

175
Tigré invaded by Cadward Baſhaw.

While Sertza Denghel employed himſelf in repreſſing the incurſions of the Galla, one Cadward Baſha, a Turkiſh officer of great valour and experience, who had been inveſted with the office of baſhaw of Maſuah, began to make inroads into the province of Tigré. The emperor haſtened to oppoſe him; but in his paſſage committed great devaſtations in the country of the Falaſha, in order to provoke them to deſcend from their mountains and come to an engagement. Theſe Falaſha profeſs the Jewiſh religion, and were then governed by a king named *Geſhen*.

176
King of the Falaſha defeated and killed.

This monarch, provoked at the ravages and deſtruction he beheld, deſcended with vaſt numbers of his ſubjects, in order to revenge it; but was killed, and his army utterly defeated by the Abyſſinians, on the 19th of January 1594. The victorious Sertza then haſtened to encounter the baſhaw; who, confident of the ſuperiority of his own troops, not only waited him patiently, but gave him every advantage he could deſire. A very deſperate battle enſued; the event of which was doubtful, till Robel, commander of part of the king's houſehold troops, who were armed with pikes, attacked that part of the Turkiſh horſe where he ſaw the baſhaw, and killed the officer who carried the ſtandard. In doing this he broke his pike; but though then deſtitute of any other weapon than a ſhort crooked knife which the Abyſſinians always carry in their girdles, he inſtantly puſhed up to the baſhaw, and with it wounded him mortally in the throat.

177
The baſhaw defeated and killed.

This unexpected event inſtantly decided the victory; the Turkiſh horſe betook themſelves to flight, and the reſt of the army ſoon followed their example. A dreadful ſlaughter enſued among the Moors, who were purſued to the iſland of Maſuah; and many were driven into the deſarts, where they periſhed with thirſt. After this, marching back to the weſtern part of his territories, the emperor proceeded to Narea, deſtroying the Galla as he went along.

178
Death of the emperor.

His laſt expedition was towards Damot to chaſtiſe ſome rebels there. Before he ſet out, a prieſt of great ſanctity and talent for divination, is ſaid to have warned him not to undertake the war; but his advice was rejected with contempt: on which he requeſted him only not to eat the fiſh taken out of a certain river; but this advice was alſo neglected, and the fiſh being really of a poiſonous nature, the king died in conſequence of eating them.

179
Two ſucceſſors nominated.

On the death of Sertza Denghel a diſpute enſued about the ſucceſſion. In the beginning of his ſickneſs the late king had named for his ſucceſſor his ſon Jacob, a boy of only ſeven years of age; but finding death approaching, he named his nephew Za Denghel, as being come to the years of manhood, and more fit for the government of ſuch a numerous and turbulent people. This laſt reſolution proved highly diſagreeable to the queen and ſome of the principal nobility, who wiſhed for a minority, during which they might engroſs the power into their own hands.

180
Jacob raiſed to the throne.

In conjunction with her two ſons-in-law, Keſla Wahad and Ras Athanaſius, therefore, the empreſs determined to raiſe Jacob to the throne, notwithſtanding the final determination of the late king abovementioned. This was put in execution immediately after the death of Sertza Denghel; Jacob was raiſed to the throne, and Za Denghel confined in an iſland of the lake Dembea or Tzana. An attempt was likewiſe made to ſeize Socinios, natural ſon to Facilidas grandſon of the unfortunate David, who had likewiſe a claim to the throne; for his not being born of a lawful marriage, was no objection in Abyſſinia. Socinios, however, no ſooner ſaw the fate of his couſin Za Denghel, than he withdrew himſelf from the power of his enemies; and Za Denghel himſelf, after being a ſhort time confined in the iſland above mentioned, found means to eſcape, and took refuge among the inacceſſible mountains of Gojam.

Thus diſappointed in their attempts on the princes, the empreſs, with her two ſons-in-law, were obliged to pretend loyalty to Jacob, whom they governed till he was 17 years of age. The young king then perceiving that his tutors were taking ſome ſteps to prolong their dominion over him, took the government into his own hands, and baniſhed one Za Selaſſe, whom they had employed in the execution of their projects, to the kingdom of Narea. The conſpirators, alarmed at this bold exertion of royal prerogative, determined inſtantly to depoſe Jacob, and raiſe Za Denghel, whom they had baniſhed, to the throne.

181 Deng- raiſed to throne.

This, however, was now a matter of ſome difficulty, as he had concealed himſelf ſo effectually among the mountains of Gojam, that he could ſcarce be found out. His retreat being at laſt diſcovered, Ras Athanaſius took an opportunity of inſulting Jacob, even while ſitting on the throne; called him an obſtinate, ſtubborn, and fooliſh boy; declared him degraded from the imperial dignity, and that Za Denghel was coming to ſupplant him. Jacob, perceiving by the inſolence of this ſpeech, that he was entirely in the power of his enemies, left his palace in the night, in order to fly to the mountains of Samen, where his mother's relations were, from whom he expected protection. He got to the borders of that country, but was there diſcovered, ſeized, and brought back to his rival, who was now ſeated on the throne.

182 cob ba- ſhed.

Za Denghel, however, with a clemency not very uſual in Abyſſinia, did not either put him to death, or mutilate him in ſuch a manner as to render him incapable of afterwards enjoying the kingdom; but contented himſelf with baniſhing him for life to Narea.

183 ecline of e Romiſh ligion in byſſinia.

Za Denghel was no ſooner ſettled on the throne, than he unluckily behaved in ſuch a manner as to alienate the affections of his people from him entirely. This was occaſioned by his attachment to the church of Rome. Ever ſince the time that the Portugueſe had joined Iſaac the Baharnagaſh, the entrance into Abyſſinia had been ſhut up by the Turks, ſo that no new miſſionaries could have acceſs; and all thoſe who came with Oviedo being dead, the Romiſh religion had languiſhed for want of preachers to ſupport it. The laſt of theſe died in 1596; and all the reſt having been dead ſome time before, little could be expected from the labours of a ſingle perſon. Next year Melchior Sylvanus, a vicar of the church at Goa, was ſent on a miſſion to Abyſſinia; being ſuppoſed to be a proper perſon for this work, on account of his language and complexion, which might baffle the vigilance of the Turks. He entered without being ſuſpected; but the great defeat given the Turks by Sertza Denghel already mentioned, had reduced their power ſo much, that leſs danger now attended this expedition than formerly, and other miſſionaries quickly followed.

184 eter Paez eſtores it.

The moſt learned, as well as the beſt qualified for the undertaking in every reſpect, was *Peter Paez*, who came to this country in the year 1600; and on his taking upon him the whole charge of the miſſion, Sylvanus returned to India. The new miſſionary did not at firſt affect to intrude himſelf on the emperor; but taking up his reſidence at the convent of Fremona in the province of Tigre, he firſt applied to the ſtudy of the learned language of the Abyſſinians called *Geez*, and in which their books are uſually written. In this he made ſuch progreſs as quickly to ſurpaſs the natives themſelves; after which he ſet up a ſchool, where the children of the Portugueſe and Abyſſinians were taught promiſcuouſly. The progreſs made by his ſcholars was ſo great, that he was ſpoken of at court, and recommended in the warmeſt terms to the emperor Jacob before his depoſition.

185 e arrives t court.

On this he was ſent for, and appeared before the court in 1604; where, to the great diſſatisfaction of the Abyſſinian monks, he received ſuch honours as are uſually beſtowed on men of the firſt quality. Next day, in a diſpute before the king, two of his ſcholars, whom he had brought along with him, fairly vanquiſhed the beſt theologians that could be found to oppoſe them. Maſs was then ſaid in the Roman manner; and this was followed by a ſermon, which in the purity and elegance of its diction (whatever the ſubſtance might be) excelled any thing that had ever been compoſed in the Abyſſinian language.

Though Paez had been called to court by Jacob, yet Za Denghel was on the throne before he arrived, and it was he who witneſſed the diſpute and heard the ſermon.

186 The emperor embraces the Catholic religion.

He was ſo much charmed with the latter, that he inſtantly reſolved to embrace the religion of the church of Rome; which reſolution he ſoon after communicated to ſeveral of his friends, and even to Paez himſelf; but under an oath of ſecrecy. The emperor's own zeal, however, rendered this oath of no uſe; for in a little time he iſſued proclamations forbidding the obſervation of the Jewiſh Sabbath, and wrote letters to Pope Clement VIII. and Philip III. of Spain, deſiring a ſupply of mechanics to inſtruct his people in the uſeful arts, and Jeſuits to teach them religion.

187 His imprudent conduct occaſions a rebellion.

This precipitate conduct had the effect which might have been expected. The Abyſſinians were generally diſaffected to the church of Rome, and no pains had been taken to gain them over: they were alſo turbulent, ſavage, and rebellious; ever ready to revolt; and now had a favourable opportunity of excuſing their treaſons under pretence of zeal for religion. This opportunity was quickly made uſe of by Za Selaſſe, whom, as we have already mentioned, Jacob had baniſhed; but who, on the advancement of Za Denghel, had probably been ſet at liberty.

183 The emperor excommunicated.

This traitor having firſt held many ſeditious meetings in private, prevailed on the Abuna, or Abyſſinian patriarch, to excommunicate the king, and abſolve his ſubjects from their allegiance. He then ſet out for the territory of Gojam, where the people had always been remarkable for their averſion to the church of Rome. In this place, therefore, he found no difficulty in raiſing an army to fight againſt his ſovereign.

189 An army raiſed againſt him.

Za Denghel, who was an expert warrior, did not fail to go in queſt of him with what forces he could raiſe; but ſoon found, by the great deſertion among his troops as he paſſed along, how much the excommunication pronounced by the Abuna had availed. This was ſo alarming, that John Gabriel, an experienced Portugueſe officer, adviſed him to decline an engagement for the preſent, and take ſhelter in ſome fortreſs until his ſubjects ſhould return to a ſenſe of their duty. This ſalutary advice was rejected, from the abſurd notion that it was a diſhonour not to fight a rebel who had defied his ſovereign. In the beginning of the engagement, victory ſeemed to favour the royal cauſe. The Portugueſe carried every thing before them, and routed that wing of the enemy which oppoſed them.

190 He is abandoned by his troops and killed.

In the other wing, however, the cowardly and treacherous Abyſſinians deſerted their king, who was quickly ſurrounded by his enemies, and left in a deſperate ſituation. A body of nobility, with his own officers and domeſtics, attended him and fought deſperately in his defence. Za Denghel himſelf, being an excellent horſeman, and admiſkilled in the uſe of arms, performed aſtoniſhing feats of valour. At laſt he was thrown to the ground, grievouſly wounded in the breaſt by a lance. Notwithſtanding this, he inſtantly recovered himſelf, drew his ſword, and reſiſted his aſſailants ſo violently, that they were fain to keep at a diſtance and annoy him with miſſile weapons. In this ſituation he ſtood till almoſt fainting with fatigue and loſs of blood; when the traitor Za Selaſſe, puſhing up his horſe violently againſt him, threw him to the ground by a blow on the forehead, and a multitude then ruſhing upon him he was diſpatched with many wounds.

191
His death univerſally lamented.

The news of Za Denghel's death were received with ſuch general indignation throughout the Abyſſinian empire, that the rebels durſt not name any ſucceſſor. As it ſeemed natural to think, however, that Jacob would now be re-elected, meſſengers were diſpatched to acquaint him of his good fortune; but during this interval Socinios appeared, not as a candidate, but as already in poſſeſſion of the empire, and ready to ſupport his rights by force of arms. His firſt ſtep was to let Ras Athanaſius know his pretenſions to the throne, and deſire his aſſiſtance with his army, promiſing to reward him as ſoon as it ſhould be in his power. Without waiting for any anſwer, he advanced ſo rapidly, that Athanaſius had ſcarce time to conſider what he ſhould reply, when a ſecond meſſage was ſent, importing that Socinios was in the neighbourhood, and ordering preparations to be made for receiving him as his ſovereign. This expeditious mode of action ſo much confounded Athanaſius, that he complied with the requiſitions, ſaluting him king, and joining his troops to his. Thus ſucceſsful in his firſt attempt, Socinios made a ſimilar one on Za Selaſſe. In this, however, he was diſappointed. Za Selaſſe having firſt ſent an equivocal anſwer, marched againſt him with his whole army; while Socinios, happening to fall ſick, and putting little confidence in Athanaſius, withdrew to the mountains of Amhara. Athanaſius likewiſe, not knowing to whom he ſhould attach himſelf, withdrew his forces, and ſtood neuter.

192
The empire claimed by Socinios.

193
He is obliged to retire.

Za Selaſſe had refuſed to join Socinios, in expectation that Jacob would make his appearance, whom he rather wiſhed to enjoy the crown than Socinios; as under the former he might hope to engroſs all the power to himſelf. For a long time, however, no anſwer was returned to his meſſages; his troops became impatient; ſo that fearing leſt a mutiny or general deſertion ſhould take place, he diſpatched a meſſenger to Socinios, acknowledging him for emperor. But ſcarce was this done, when a meſſenger arrived from Jacob, informing him that he was then in Dembea, and promiſing Za Selaſſe great honours if he would acknowledge him for his ſovereign. With theſe terms the traitor inſtantly complied, and his example was followed by Athanaſius; while Socinios, not as yet able to reſiſt all his enemies, retired again to Amhara. This, however, he was not long of accompliſhing. Jacob was by no means poſſeſſed of equal military ſkill; and though Za Selaſſe was an experienced officer, yet his extreme perfidy, pride, and obſtinacy, rendered it very dangerous to have any concern with him. This appeared remarkably in the preſent caſe. His pride in the firſt place would not allow him to join his forces to thoſe of Jacob, leſt the latter, who was inferior in military ſkill, ſhould have a ſhare in the victory he was to gain. Then, intoxicated with his opinion of himſelf, he neglected to behave with the caution neceſſary in the neghbourhood of ſuch an experienced general as Socinios, which gave the latter an opportunity of cutting off almoſt his whole army. Being now obliged to fly with a few attendants to Jacob's camp, he met with an indifferent reception on account of his defeat; for which reaſon he made propoſals to join Socinios. The latter accepted his offer. though he could put no confidence in one who had been guilty of ſuch complicated treachery; only he thought it would be an advantage to put it out of his power to join his antagoniſt. Jacob, on the other hand, confident in his numbers, which are ſaid to have been almoſt 30 to 1, advanced boldly to give his antagoniſt battle. Socinios declined the engagement till he had drawn him into a ſituation where his numerous forces could not act; ſo that a dreadful carnage enſued, Jacob himſelf periſhing among the multitude, and his body being never found afterwards. In this battle alſo was killed the wicked prieſt Abuna Petros, who was the occaſion of Za Denghel's death, as we have already related. Ras Athanaſius eſcaped by the ſwiftneſs of his horſe, and took refuge in a neighbouring monaſtery. He was afterwards pardoned at the interceſſion of Peter Paez; but his goods and eſtate being confiſcated on various occaſions, falling into univerſal contempt, and being abandoned by his wife, he died at laſt of want. According to the Abyſſinian accounts, Socinios ordered the purſuit to be ſtopped as ſoon as he ſaw the head of Abuna Petros; but the Portugueſe writers inform us, that he kept it up with the utmoſt vigour throughout the whole day and part of the night. They particularly mention, that a number of Portugueſe, who had joined the army of Jacob, loſt their lives on this occaſion, by falling over a precipice which they could not avoid in the dark. One of theſe named *Manuel Gonſalvez* had the good luck to light on a tree, where he ſat till morning in the utmoſt terror, but at laſt made a ſhift to clamber up and eſcape.

194
Jacob ſet up in oppoſition to him.

195
Bad conduct and defeat of Za Selaſſe Jacob's general.

196
Jacob defeated and killed.

By this victory Socinios was fully eſtabliſhed on the throne, though his ſituation might ſtill be accounted precarious by reaſon of the rebellious diſpoſition of many of the provinces. He began with making a general proclamation of pardon, excepting only the murderers of Za Denghel, with whom he had been in terms of intimate friendſhip. Being informed therefore, that one *Mahardin*, a Moor, had given him the firſt wound in that battle in which he was killed, he ordered his head to be inſtantly ſtruck off with an ax before the gate of the palace.

197
Socinios f vours the Portugue

The Portugueſe were much favoured by this prince; and they were become very numerous by continual intermarriages with the Abyſſinians; the male children being always trained to the uſe of fire-arms by their parents, and incorporated as ſoldiers with them; and they were now all united in one body under an experienced officer named *John Gabriel*, whom we have already had occaſion to mention. As their numbers and valour made them objects of conſideration, Socinios determined to attach them to himſelf as much as poſſible; and the beſt means to do this he knew was by favouring their prieſts. Peter Paez was therefore ſent for to court; where a diſpute concerning

198
reſolves
embrace
Catho-
religion.

cerning the ſupremacy of the pope and the two natures of Chriſt (the great ſubjects of debate in Abyſſinia), took place, and a ſermon was preached with as great ſucceſs as that in Za Denghel's time. The king firſt enlarged the territory poſſeſſed by the Jeſuits at Fremona; after which he declared to Paez his reſolution of embracing the Catholic religion; giving him at the ſame time two letters, one to the king of Portugal, the other to the Pope, the purport of which was to requeſt a number of more Portugueſe to deliver Abyſſinia from the incurſions of the Galla, as they had formerly done from the yoke of the Moors.

199
impoſ-
pretend-
g to be
e late em
ror, Jacob
pears.

200
defeated.

Before any thing of importance could be done in matters of religion, the king was called forth to ſuppreſs a rebellion which had already taken place. An impoſtor had appeared, who called himſelf *Jacob* the late king, and pretended to have eſcaped from the battle; but ſo much wounded in the face that he kept one ſide of it conſtantly covered to conceal the deformity. He made his appearance among the mountains of Habab near Maſuah; and being joined by great numbers of people, Sela Chriſtos, brother to the king, and governor of Tigré, marched againſt him. The impoſtor's troops, though numerous, fled at the firſt onſet; but he eſcaped to the mountains, where it was very difficult to follow him. This, however, was attempted; and a great many of the poſts he had taken were ſtormed like as many forts: but ſtill the impoſtor himſelf, though driven from place to place, found means to make good his retreat to the country lying between the mountains of Habab and the territory of the Baharnagaſh. Thither he was purſued by Selah Chriſtos; but that general, finding the rebellion likely to ſpread through the whole province of Tigré, thought proper now to acquaint his brother Socinios with the ſtate of affairs, and to deſire his aſſiſtance. The king, though at that time he had ſent away moſt of his troops in an expedition againſt the Shangalla and Gongas, who dwell on the northweſt of Abyſſinia, ſet out immediately with ſuch troops as he could collect. Theſe were but few in number; his cavalry particularly, amounting to no more than 530, beſides a ſmall reinforcement brought by his brother Emana Chriſtos, governor of Amhara. As he proceeded, he was informed that a party of Galla were lodged on a hill at no great diſtance from him. Determining to cut them off, he ſurrounded the hill where they were poſted; but having cauſed his cavalry to advance before, and paſs a deep ravine, they were almoſt entirely deſtroyed, while the reſt of the army were ſeized with ſuch a panic that they refuſed to ſtir. In this extreme danger, the Galla paſſed the ravine to attack them; but the king having advanced ſingly, and killed the firſt of them, his troops, aſhamed of their cowardice, ruſhed forward on the enemy, and gained a complete victory, which obliged the ſavages to leave the province they infeſted at that time.

201
e Galla
feated.

202
e impo-
r Jacob
ain de-
ted.

The misfortune of the cavalry on this occaſion quickly occaſioned a report that the king had been defeated; of which the impoſtor Jacob did not fail to take advantage; and deſcending from his mountains, committed great devaſtations in the low country. But though attended by a great multitude, who likewiſe fought with more obſtinacy than formerly, he was ſtill defeated by Sela Chriſtos with a force greatly inferior. But before any thing effectual could be done for his reduction, the Galla made a dreadful irruption into the ſouthern provinces, murdering all who fell into their hands, and burning and deſtroying towns, churches, and villages, in the moſt dreadful manner. The king bore thoſe exceſſes for ſome time with patience, till at laſt he drew them into ſuch a diſadvantageous ſituation, that being ſurrounded by his forces, and inferior in number as well as in valour, they were all cut off to a man, with the loſs of only 400 on the part of the Abyſſinians. Soon after this victory the king underwent the ceremony of coronation. He then marched againſt the impoſtor Jacob; but the latter was too ſenſible of the ſuperiority of his rival to face him in the field. He therefore retired again to his mountains, while the king left the ſuppreſſion of the rebellion to an experienced officer named Amſala Chriſtos; who employed two young men, that had been outlawed for murder, to aſſaſſinate the impoſtor. This being done, it was found that the pretended Jacob was no other than a herdſman among thoſe mountains to which he ſo conſtantly fled for refuge; and that he had neither wound nor ſcar on his face, but had kept one half of it covered to conceal the little reſemblance he bore to Jacob whom he perſonated.

203
An army of
Galla cut
off.

204
Coronation
of the king.

205
The impoſ-
tor Jacob
aſſaſſinated.

206
Dangerous
rebellion
begun by
Melchize-
dec.

207
Defeats one
of the king's
generals.

208
Cauſes Ar-
zo be pro-
claimed
king.

The king being now freed from this rebellion, began again to turn his thoughts towards religion. His firſt ſtep was to make an handſome preſent to the Jeſuits; but he ſoon ſhowed his inexperience in religious matters, by attempting to reconcile the two contending parties in his empire. Before he could ſee the folly of this attempt, however, his attention was called by a moſt dangerous rebellion, which was begun by one Melchizedec, a ſervant of the late Sertza Denghel, but a man of great experience in war. He was firſt oppoſed by Sanuda, a brave officer; but being totally deſtitute of troops, he was obliged to apply to the attendants of the king of Sennaar, who had been depoſed by his ſubjects, and was at that time in Abyſſinia. Theſe readily joined him; and a bloody battle enſued, in which Sanuda was ſo totally defeated, that he alone had the good fortune to eſcape, and that grievouſly wounded, his men being all killed on the ſpot. On this misfortune Socinios ſent his brother Emana Chriſtos with a conſiderable force to reduce the rebels. Melchizedec finding himſelf oppoſed by ſuch an able general, exerted himſelf to the utmoſt, in order to raiſe a force ſufficient to reſiſt him; and in this he ſucceeded ſo well, that his army ſoon ſtruck terror into all the neighbouring country, notwithſtanding the preſence and known valour of the king's brother. A prince of the blood-royal, named *Arzo*, was likewiſe found out and proclaimed king, in order to give ſome ſanction to the rebels; ſoon after which they boldly marched to meet the royal army. The engagement took place on the 9th of March 1611, and was fought with great obſtinacy on both ſides: the advantage even appeared for ſome time on that of the rebels; till Emana Chriſtos, perceiving that all was at ſtake, puſhed deſperately forward to the place where Melchizedec himſelf was. The latter ſeeing no probability of avoiding a ſingle combat, which he did not chooſe to try, inſtantly turned his horſe and fled; and the reſt of the army ſoon followed his example. Melchizedec,

however,

however, did not much avail himſelf of this cowardice; for he was cloſely purſued by the peaſants, taken priſoner, and executed as a traitor, together with ſeveral of his principal officers.

209
Is defeated, taken priſoner, and put to death.

The fate of Prince Arzo, whom, to ſupport their cauſe, the rebels had proclaimed king, is not known.

210
The rebellion continues.

This victory, ſo far from extinguiſhing the ſpirit of rebellion, ſeemed to have inflamed it beyond all bounds: for news were now received that the whole country round the head of the Nile to the province of Tigré had revolted; ſo that there was a neceſſity for the immediate preſence of the emperor himſelf; and even this was inſufficient, as the rebels were diſperſed over ſuch a large tract of territory. His two brothers, Emana and Sela Chriſtos, were therefore both employed againſt different rebel chiefs, while the king marched againſt thoſe who were moſt formidable.

211
Cruel manner of carrying on the war.

The principle on which this war was carried on, ſeems to have been very cruel, viz. that of killing all the men, and carrying off the women and children for ſlaves. This was punctually executed, firſt upon the inhabitants of a mountainous diſtrict named *Guſman* on the Nile; though, at the interceſſion of the miſſionary Peter Paez, the women and children, inſtead of being ſold for ſlaves, were given to the Jeſuits to be educated in the Catholic religion. The Gongas and Agows were next attacked with equal ſucceſs, and ſtill greater cruelty; one of their tribes, named *Zalabaſſa*, being almoſt entirely exterminated: but this, inſtead of having any good effect, ſeemed to multiply the rebels ſtill more. The Agows and Galla invaded the provinces in the neighbourhood;

212
Amdo, another impoſtor, ſupported by the Jews.

and another impoſtor, whoſe true name was *Amdo*, but who pretended to be the unfortunate emperor Jacob, appeared as a competitor for the crown. This laſt rebel proved much more formidable than any of the reſt. He was indeed ſurpriſed before he had time to collect any forces; but Gideon, king of the Jews of Samen, having killed the guards who watched him, ſet the impoſtor at liberty, and ſupported his cauſe. Thus he ſoon collected a very formidable army, with which he defeated and killed an officer named *Abram*, who oppoſed him with a conſiderable force. This brought Socinios himſelf againſt him, who inſtantly attacked the Jewiſh monarch Gideon, as being the principal ſupport of his cauſe.

213
War with Gideon.

As the country of the Jews was naturally ſtrong, and very full of fortified places, the reduction of it was evidently a very difficult taſk. The firſt place attacked was a fortreſs named *Maſſiraba;* which, though very ſtrongly fortified and garriſoned, was ſoon taken by ſtorm, and every one in it put to the ſword without diſtinction. Hotchi and Amba Za Hancaſſe, two other ſtrong fortreſſes, ſhared the ſame fate. A fourth, named *Senganat*, no leſs ſtrong than any of the former, was alſo taken; Gideon himſelf narrowly eſcaping with his life in the attack. Diſcouraged therefore by ſo many misfortunes, and apprehending the total ruin of his country, this prince at laſt was content to ſue for peace; which was granted on condition that Amdo ſhould be delivered up.

214
Amdo delivered up and put to death.

This traitor was condemned to a puniſhment very unuſual among Chriſtians, *viz.* that of being crucified; but in nailing him to the croſs, his cries and groans ſo much affected the king, that he ordered him to be taken down and beheaded.

The war was now reſumed againſt the Gongas and Guba; whom the king annually invaded for the purpoſe of making ſlaves. In this expedition his officers not only executed their commiſſion againſt theſe ſavages, but likewiſe carried off a great number of cattle from the Agows, who were then at peace with the emperor.

215
Other mil tary exp ditions.

This conduct was highly reſented by Socinios, who obliged them to make reſtitution of what they had taken away; and the doing them juſtice in this particular, had more effect in reducing the reſt of theſe people to obedience, than all the cruelties which had been committed ſince the beginning of the war.

In 1616, the emperor ſet out on an expedition againſt the Galla; but this was laid aſide on the death of his eldeſt ſon, for whom he entertained a great affection.

216
The Jews exterminated.

It was ſucceeded by a very cruel order againſt the Jews, whom Socinios now determined to exterminate without any apparent occaſion. His commands, however, were executed with the utmoſt punctuality, ſo that very few eſcaped; and among the reſt periſhed their prince Gideon lately mentioned. He was ſuppoſed to be immenſely rich, and to have concealed his riches, which have been ſought for in vain by the Abyſſinians from that time to the preſent. The children of the murdered Jews were ſold for ſlaves; and ſuch of the profeſſion as were ſcattered through the empire, had orders to renounce their religion and be baptized, under pain of death. Thus almoſt the whole Jewiſh religion was extinguiſhed at once, as moſt of them choſe rather to embrace Chriſtianity than ſuffer death. In token of the ſincerity of their converſion, they were all ordered to plow and harrow on the ſabbath day.

217
Succeſsful expedition againſt th Galla.

This butchery being over, the expedition againſt the Galla was reſumed, and carried on with the uſual cruelty; while the Galla never once appeared to prevent the deſolation of their country. Next year, however, a new aſſociation was made among theſe ſavages, and the empire invaded by them in two different parts at once. One of their armies was cut off to a man before they had time to begin their ravages; while the other fled on the firſt approach of the royal army, leaving their wives, children, and baggage, to the mercy of the enemy. Thus the king was left for a ſhort time at reſt from rebellions or foreign invaſions; and this interval he determined to make uſe of in making war on his neighbour the king of Sennaar, from whom he had formerly received an affront.

218
War wit Sennaar, &c.

In this expedition he was aſſiſted by one Wed Ageeb, a prince of the Arabs, who lived on the frontiers of Abyſſinia. The allies proceeded with their uſual cruelty, killing all the men, and ſelling the women and children for ſlaves. Vaſt numbers of cattle were carried off; and the victorious armies returned with an immenſe booty. The next expedition was againſt Fatima queen of the Shepherds, otherwiſe called *queen of the Greeks*, who reſided on the north-eaſt of Atbara. In this alſo the king proved ſucceſsful, though leſs blood was ſhed than uſual: but it was not long before this extraordinary ſucceſs met with a ſevere check by the entire loſs of an Abyſſinian army; the favourite ſon of the emperor himſelf being killed in the engagement, with ſome of the beſt officers in the empire.

219
Progreſs the Ro religion.

All this time Peter Paez had applied himſelf with the utmoſt aſſiduity to the converſion of the Abyſſinians to the Catholic faith; and in this undertaking he

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cellent
aracter of
ter Paez.

he had been attended with wonderful ſucceſs. He was indeed of all others the moſt fit for an undertaking of this kind among a rude and barbarous people. Beſides an uncommon ſhare of learning, he poſſeſſed an eminent degree of ſkill in the mechanical arts; by which he was enabled to teach the Abyſſinians how to build houſes of ſtone and lime, which they had never known before. In theſe he was at firſt maſon, carpenter, ſmith, and architect, himſelf; and thus, to the aſtoniſhment of the whole empire, he built ſome churches and a palace for the king. His univerſal genius prepared the people for the reception of his opinions; while the barbarous ignorance and ſavage manners of his antagoniſts tended to prejudice every one againſt their tenets, though ever ſo juſt in themſelves. Sela Chriſtos, the king's brother, is ſaid to have been converted by only reading the Abyſſinian books with attention; in which, it ſeems, the ignorance of the prieſts had been diſplayed in an extraordinary manner. We have already ſeen how well the emperor himſelf was diſpoſed towards the Romiſh church; and his example was followed by many of the principal people of the kingdom. At laſt the Abyſſinian patriarch named *Simon* made a complaint, that irregularities in religion had been committed; and diſputes held on matters of faith without calling him, or permiſſion granted him, to ſupport his clergy in theſe controverſies. As Socinios had no opinion of this prieſt's learning or eloquence, he did not imagine that any harm could enſue to the cauſe from granting what he wanted. A public diſpute was accordingly appointed; in which Simon's inferiority was ſo apparent, that Socinios now publicly declared his belief in the two natures of Chriſt.

221
Letters from the pope and king of Spain.

While the converſion was in this proſperous way, letters arrived from the pope and king of Spain, but without any promiſe of the temporal aſſiſtance, *viz.* the ſoldiers he had ſolicited; though they aſſured him of an ally far ſuperior, the Holy Spirit himſelf, provided the emperor continued firm in his reſolutions of embracing the Catholic faith. Socinios would probably have been as well ſatisfied with an account of a

222
Determines to ſubmit to the pope.

reinforcement of ſoldiers; but as matters ſtood, he was obliged to be content, and reſolved to ſubmit in form to the pope, renouncing for ever his connection with the Greek church. As it was improper, however, to ſend letters on a ſubject of ſuch importance by a common meſſenger, proper perſons were to be appointed who might occaſionally aſſume the character of ambaſſadors, and act accordingly. This being reſolved on, the next thing was to determine the way by which the ambaſſadors were to reach Europe. The uſual track by Maſuah was now ſhut up on account of the rebellion which exiſted in the neighbouring provinces; ſo that the more eligible way ſeemed to be through Narea and the provinces to the ſouthward, by which they might reach Melinda, and from thence embark for Goa.

223
Ambaſſadors ſet out for Europe.

The ambaſſadors were choſen by lot; which falling firſt on Antonio Fernandez, he named Fecur Egzie as his companion; and, all things being ſettled, theſe two ſet out for Gojam in the beginning of March 1613. It ſeems ſurpriſing that the Abyſſinian monarch ſhould have ſent theſe ambaſſadors on ſuch a dangerous expedition without a proper guard through the barbarous countries they had to paſs. This, however, ſeems undoubtedly to have been the caſe; as we hear of no other attendants they had than 10 Portugueſe taken with him by Fecur Egzie, ſix of whom were to go no farther than Narea, but the other four were to proceed to India; forty men armed with ſhields and javelins were alſo granted, but this force was undoubtedly too ſmall to anſwer any uſeful purpoſe. Sela Chriſtos indeed furniſhed them with guides from the barbarous nations in the neighbourhood of Narea, taking hoſtages for the ſecurity of the travellers; but the inſufficiency of theſe precautions ſoon appeared.

224
Account of their journey.

Our travellers had proceeded but two days journey into the country of the Gongas, when they were treated in ſuch an hoſtile manner, that one of the Portugueſe was obliged to return with Fernandez to complain of the behaviour of the ſavages. On this information Sela Chriſtos inſtantly diſpatched three officers, with a proper number of troops to chaſtiſe them; by which means the ambaſſadors got ſafe to Mine, the name of ſome miſerable villages on a ford of the Nile. Here they croſſed the river on ſkins blown up, and next day entered the country of the Pagan Galla; and ſoon after, though not without great difficulty, they reached the kingdom of Narea the moſt ſoutherly province of the Abyſſinian empire, but quite ſurrounded by the Galla. Here they were received with great kindneſs by the commanding officer of the firſt fortified place they came to; but on being introduced to the king himſelf, they met with a very indifferent reception. This was owing to the inſinuations of an Abyſſinian monk, that they were to bring Portugueſe ſoldiers that way into Abyſſinia; which would be deſtructive to his kingdom. On calling a council, it was reſolved to ſend them into the kingdom of Bali; ſo that they would be obliged to paſs through a much more difficult and dangerous road than what was firſt intended. Having thus, as he ſuppoſed, provided againſt the danger which threatened his kingdom, he made them a preſent of 50 pieces of gold, recommending them at the ſame time to the ambaſſador from the ſovereign of Gingiro, thro' which they were next to paſs.

On leaving Narea, they received a convoy of 80 ſoldiers to conduct them ſafely to their next ſtage; after which they paſſed four days through countries totally laid waſte by the Galla, and where they were obliged to hide themſelves for fear of meeting with theſe ſavages. Proceeding ſtill through woods and vaſt chains of mountains, they came to the river Zebee, or more properly *Kibbee*, from its white colour reſembling melted butter, as the word imports.

225
Deſcription of the river Zebee.

Fernandez deſcribes this river as larger than the Nile, and vaſtly more rapid. They paſſed it by a kind of bridge, but certainly a moſt tremendous one The channel of the river is full of rocks; and betwixt every two of theſe a ſingle tree was laid, ſo elaſtic that it would bend with the weight of one perſon; while the vaſt height of the precipice, and the ſight of the roaring current below, was ſufficient to ſtrike the boldeſt with terror. At a ſmall diſtance from this bridge was a ford, through which it was neceſſary that their mules ſhould paſs; which being accompliſhed without any accident, though with difficulty and danger, they entered the territory of Gingiro. Here they were hoſpitably received by the ſovereign. and after a mutual exchange of preſents proceeded to Sangara, the capital of another ſmall kingdom named *Cambat*, which was at this time governed by a Moor named *Amelmal*. During the time of their reſidence here, one Manquer, a ſchiſmatic Abyſſinian, arrived, who inſinuated to the king that the recommendations they had brought along with them were falſe. This reduced them to the neceſſity of ſtaying there till meſſengers could be ſent to Socinios to know whether it was ſo or not; which occaſioned a delay of three months. At laſt orders were brought to ſend them off immediately. This favourable anſwer procured the diſmiſſion of the ambaſſadors with preſents; while the malicious Manquer was detained priſoner. He eſcaped, however, and overtook them in the next kingdom, named *Alaba*, which was governed by a Moor named *Aliko*. Here he accuſed them of a deſign to overturn the Mahometan religion altogether: which ſo exaſperated the barbarian, that he threatened them all with death; and actually put them in priſon, where ſome of the Portugueſe died.

226
They are obliged to return.

At laſt, after holding a council in which Manquer gave his voice for putting them to death, it was reſolved that they ſhould be ſent back to Amelmal; which was accordingly done, and from his dominions they returned to Abyſſinia. Thus ended this memorable embaſſy, by which the Pope was deprived of any authentic documents which might ſhow that any Abyſſinian emperor had ever voluntarily ſubmitted to him; and there can be no doubt that this miſcarriage, more than any thing elſe, prevented the eſtabliſhment of Popery in this country.

227
A number of rebellions on account of religion.

Socinios had now gone ſo far in favour of the Catholic party, that he began to ſhare in ſome meaſure the fate of Za Denghel, numberleſs conſpiracies being formed againſt him; which it was undoubtedly owing only to the altered ſituation of affairs by the preaching and aſſiduity of Peter Paez, that he was able to withſtand. The conſpirators were at this time ſupported, not only by the Abuna, but by Emana Chriſtos himſelf, the king's brother, whom we have frequently had occaſion to mention.

228
The Abuna excommunicates the emperor, but is obliged to withdraw his ſentence.

Their firſt ſtep was the very ſame which had been ſo ſucceſsfully taken by Za Selaſſe in the time of Za Denghel, viz. to pronounce ſentence of excommunication on the emperor. He was at that time abſent on an expedition againſt the Agows; but returned immediately on hearing what was tranſacted in his abſence; informing the Abuna, that if he did not recal the excommunication without delay, his head ſhould pay the forfeit. This ſpirited declaration had ſuch an effect, that the Anathema was annulled, and the conſpiracy diſſolved for that time.

229
Attempts to aſſaſſinate the emperor.

It was next reſolved between Emana Chriſtos the king's brother, Julius his ſon-in law, and Kefla Wahad maſter of the houſehold, to aſſaſſinate the king in his palace. To accompliſh this purpoſe it was concerted that they ſhould deſire an audience; that Julius ſhould enter firſt, and preſent a petition of ſuch a nature as would probably be refuſed: on this he was to begin an altercation; and during the continuance of it the other two aſſaſſins were to come up, and ſtab their ſovereign before he had time to put himſelf in a poſture of defence. Happily for Socinios, however, he was informed of his danger by a page juſt before Julius made his appearance: on which, inſtead of refuſing the petition, he granted it immediately; ſo that there was no room for diſpute. He then got up to walk; which was ſcarce done when Emana Chriſtos alſo came; on which Socinios invited them all to the terrace to walk with him. This prevented their falling upon him at that moment; and as they ſuppoſed they would have ſtill a better opportunity on the terrace, they readily conſented.

230
It miſcarries.

But Socinios having opened a private door, at which he entered firſt, drew it quickly after him; and as this door had a ſpring lock made by Peter Paez, which ſhut it in the inſide but could not be opened from without. the conſpirators were diſappointed. Being alſo ſenſible that their deſign had been diſcovered, they were obliged for ſome time to keep at a diſtance, but did not for that reaſon abandon their wicked projects.

231
The rebellious ſpirit of the conſpirators continues.

Their next ſcheme was to be put in execution when the king was abſent on an expedition againſt Sennaar, who had made a violent irruption into the Abyſſinian territories. The object now was not the aſſaſſination of the emperor, but of his brother Sela Chriſtos; becauſe the emperor had taken the government of Gojam from Emana Chriſtos, who was a ſchiſmatic, to give it to Sela Chriſtos, who was a violent Catholic.

232
Julius the emperor's ſon-in law firſt appears in arms.

The enterpriſe was begun by Julius; who iſſued a proclamation, that all thoſe who believed two natures in Chriſt ſhould leave the province of Tigré, where he was governor; and that ſuch as were true friends to the Alexandrian faith ſhould repair to his ſtandard to fight for it. He then ordered the goods of all the Catholics in Tigré to be confiſcated; and marched without delay into Gojam, in hopes to ſurpriſe Sela Chriſtos. But here the whole ſcheme was baffled by the vigilance and activity of the emperor; for he having received information of what was going forward, returned into that province before the conſpirators had received certain intelligence of his having left it.

233
Is deſerted by his aſſociates.

This ſo much damped the ardour of Emana Chriſtos and Kefla Wahad, that they ſtood aloof without attempting any thing till Julius ſhould try his fortune. That rebel was at firſt very much diſconcerted; but ſoon recovering his courage, advanced to the place where the Nile iſſues out of the lake of Dembea, where he met with the Abuna. Being confirmed by that prieſt in his wicked deſigns, he reſolved, by his advice, to fall upon the king before he could be joined by Sela Chriſtos, Simon himſelf (the Abuna) offering to ſhare his fortune; and to confirm all, a new and ſolemn excommunication was pronounced againſt the king and all his adherents.

234
Socinios excommunicated a ſecond time.

Socinios, alarmed at theſe proceedings, ſent a meſſage to Sela Chriſtos, deſiring him to come to his aſſiſtance as faſt as poſſible. In the mean time he himſelf advanced to meet Julius; but choſe his poſts ſo judiciouſly, that he could not be forced to an engagement without great diſadvantage on the part of the enemy. Notwithſtanding this, Julius pitched his camp cloſe to that of the king, with a deſign to force him to a battle at all events. This raſh action was followed by one ſtill worſe. Simon had perſuaded him, that as ſoon as the royal army ſhould ſee him, they would abandon the ſtandard of the emperor to join his.

235
His raſhneſs and death.

On this, without farther conſideration, he ruſhed into the camp of Socinios with a very few attendants, and reached the emperor's tent. Here he was known by the guards, and inſtantly diſpatched with all his followers; the whole army betaking themſelves to flight after his death, and being purſued with great ſlaughter by the royaliſts. The plunder of the camp

camp was immenſe, Julius having brought all his riches, which he had amaſſed by a long courſe of extortion, into the field along with him; and all of theſe were diſtributed among the ſoldiers. A vaſt number of cattle were likewiſe taken, which Socinios diſtributed among the prieſts, judges, and lay-officers. By this complete victory the whole ſcheme of the conſpirators was overthrown. Emana Chriſtos having no forces capable of coping with his brother, and unwilling, as we have ſaid, to aſſiſt Julius openly, had retired to a high mountain named *Melca Amba*, in the territory of Gojam. Here he was inveſted by Af Chriſtos, an experienced general, whom Sela Chriſtos had left governor when he joined the emperor. Emana, who was likewiſe an expert commander, would have made a vigorous defence; but unfortunately the mountain was ſo deſtitute of water, that in three days he was delivered up by his own men to ſave themſelves from periſhing with thirſt. On being brought to the king, he was tried in a full aſſembly of judges, and condemned to death; but the king pardoned and ſent him to Amhara.

236
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hriſtos
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rdoned.

This terrible conſpiracy had been occaſioned by the diſpute concerning the two natures of our Saviour: another quickly followed on account of the diſpute concerning the Sabbath-day; the Abyſſinian church inſiſting on the obſervance of the ſeventh day of the week as a Sabbath, and the Romiſh church on the obſervance of the firſt day. The author of this rebellion was one Jonael, who had been concerned in the expedition formerly mentioned, in which the Agow's cattle were driven away, and afterwards reſtored by the king. It is more than probable that his reſentment on this account contributed much to increaſe his zeal on the preſent occaſion; but whatever was the real cauſe, religion was the ſole pretence. He began with a moſt inſolent but anonymous letter to the king; in which the arguments of the Alexandrians for the obſervance of the Jewiſh Sabbath were ſtated, and the contrary doctrine condemned with the utmoſt virulence of expreſſion. The king himſelf was reviled in the moſt opprobrious manner, compared to another Diocleſian, the Jeſuits ſaid to be relations of Pontius Pilate, and all of them devoted to hell without redemption. By this ſtupid performance the king was ſo much offended, that he added a clauſe to the former proclamation, commanding that "all out-door work, ſuch as plowing and ſowing, ſhould be publicly followed by the huſbandman on the Saturday, under penalty of paying a web of cotton-cloth for the firſt omiſſion, the value of the cloth to be 5 s.; the ſecond offence to be puniſhed by a confiſcation of moveables, and the offence not to be pardoned for ſeven years." To this Socinios added a ſpeech from the throne in vindication of himſelf, concerning the part he had taken in religious matters; and to ſhow that he was in earneſt, cauſed the tongue of a monk to be cut out for denying the two natures of Chriſt, and one of his generals to be whipt for obſerving the Jewiſh Sabbath.

237
Another re-
ellion by
onael.

In the mean time Jonael having collected what forces he could, openly declared againſt his ſovereign; but not daring to meet him in the field, he retired into the country of the Galla, on hearing that Socinios was approaching him with an army. On this the king entered their territories, and laid them waſte; which created a diſſention among the ſavages themſelves; one party being for affording him protection, the other for delivering him up. This being made known to the king, he ſent a few preſents to the faithleſs barbarians of Jonael's party; who returned his kindneſs by ſending him the head of the rebel, though but a ſhort time before they had fought with their brethren for his reſcue.

238
He is murdered by the Galla.

A more formidable enemy than Jonael, however, ſtill remained. The province of Damot was one of the moſt diſaffected to Socinios in the whole empire; and to this place the greateſt part of the religious fanatics in other provinces had retired. They now muſtered up an army of more than 12,000 men, among whom were 400 monks, all of them armed with ſhields, lances, and ſwords; inſpired, beſides, with ſuch a degree of religious enthuſiaſm, that they expected to be rendered invulnerable by all terreſtrial weapons, and that armies of angels would fight in their cauſe. Againſt theſe Sela Chriſtos was diſpatched with about 7000 excellent ſoldiers; and as the general himſelf was a zealous Roman Catholic as well as moſt of his men, we need not doubt that both parties imagined themſelves ſure of the protection of heaven, and conſequently that the encounter would be very violent. The two armies met on the 16th of October 1620; but Sela Chriſtos was unwilling to deſtroy the infatuated people, who he knew would be unable to reſiſt his veteran troops. He therefore firſt ſhowed them his ſuperiority in ſome ſkirmiſhes; and then ſent a pathetic meſſage, offering a general pardon if they would lay down their arms. The meſſengers, however, were not allowed to approach, ſo that an engagement became unavoidable. The numbers of the rebels, as Sela Chriſtos had foreſeen, availed very little againſt the diſcipline of the veterans he commanded. The 400 monks made a moſt obſtinate reſiſtance; and did not yield till after 180 of them had been killed on the ſpot.

239
Another rebellion.

240
Deſperate enthuſiaſm of the monks.

Socinios, having once more vanquiſhed his enemies, now determined to ſhow his attachment to the church of Rome more openly. Having therefore ſent for Peter Paez, he told him his final reſolution to embrace the Catholic religion in its full extent; after which he renounced the Alexandrian church in the moſt explicit manner. His renunciation was followed by a proclamation vindicating his conduct; in which, beſides the arguments uſed for the Pope's ſupremacy, &c. he inſiſted much on the bad lives of the clergy of the oppoſite party, and for which it appeared that there was in reality too much foundation. This was the laſt work of the excellent miſſionary Peter Paez, who died of a fever immediately after his leaving the king. The example of the ſovereign, however, had very little effect upon his ſubjects. The proclamation was followed by a new rebellion in Amhara. Unluckily the enemies of his brother Sela Chriſtos had perſuaded Socinios to deprive him of his government; and there was no other in the kingdom who could be entruſted with ſuch an important commiſſion; ſo that the king ſoon found himſelf under a neceſſity of replacing and committing to him the charge of the war againſt the rebels. In this he was attended with his uſual ſucceſs: for the rebel chief, finding himſelf unable to contend with his enemy, repaired for aſſiſtance to the

241
The emperor publicly renounces the Alexandrian faith.

242
A new rebellion breaks out.

243 The rebel chief murdered by the Galla.

Galla ; who no ſooner had him in their power than they killed him on the firſt offer of the imperial general, mangling his body in ſuch a manner that ſcarce a bit of it remained to be ſent to his antagoniſt.

244 A new patriarch and miſſionaries arrive in Abyſſinia.

245 Socinios takes an oath of ſubmiſſion to the pope.

246 Violent conduct of Sela Chriſtos,

In the mean time news of the revolution in religious matters which had taken place in Abyſſinia, arrived in Europe. Though the embaſſy to the Pope and king of Spain could not paſs, as has already been related, yet frequent accounts had been otherwiſe tranſmitted ; which produced ſuch an effect, that a new ſet of miſſionaries, with a patriarch (Alphonſo Mendez) at their head, were ſent to Abyſſinia. They arrived at Gorgora, the ſeat of royal reſidence, in the beginning of the year 1626 ; and at the very firſt audience of the emperor, it was agreed that he ſhould take an oath of ſubmiſſion to the Pope. The ceremony was performed with all the ſplendor that could be contrived : the patriarch then preached a ſermon on the Pope's ſupremacy in the Portugueſe language, intermixed with Latin quotations ; which is reported to have greatly confirmed the faith of the emperor and his brother, though neither of them underſtood a word of the languages in which it was preached. An anſwer to this unintelligible diſcourſe was made in the Amharic language, which was equally unintelligible to the patriarch and his attendants ; and to this the patriarch added a few words of a reply equally ill underſtood. At the concluſion of the diſpute, an oath of the Pope's ſupremacy was taken by the emperor himſelf on his knees, then by the princes, and afterwards by all preſent, according to their different ſtations. Sela Chriſtos, not contented with taking the oath, drew his ſword, and in words not eaſily underſtood, denounced vengeance on "thoſe who fell from their duty ;" and he likewiſe added to the oath of ſupremacy another to the emperor and Facilidas the Prince Royal ; but if the latter ſhould fail in the defence of the Catholic faith, he ſwore to be his greateſt enemy : nor would he be ſatisfied without impoſing this clauſe upon all the officers, whether civil or military, then preſent.

247 And of the emperor and patriarch.

This violent conduct of Sela Chriſtos procured him a number of enemies, and at laſt was the occaſion of his deſtruction ; but that of the king and patriarch ſet the whole empire in a flame. An excommunication was firſt pronounced upon all who did not keep the oath : a proclamation was next iſſued, that all prieſts ſhould previouſly embrace the catholic religion under pain of death ; and that every one, under the ſame penalty, ſhould obſerve Lent and Eaſter according to the rules of the Romiſh church. The patriarch proceeded in the ſame ſtyle ; re-ordaining the clergy, conſecrating the churches over again, rebaptizing the people, even ſuch as were full-grown, abrogating circumciſion, polygamy, and divorce (for theſe had been allowed by the Alexandrian church), and reducing the moveable feaſts entirely to the rules of the church of Rome.

Though polygamy and divorce are no doubt inconſiſtent with the pure doctrines of the goſpel, yet it was very improper to meddle with theſe practices at once in ſuch a violent manner. Beſides the confuſion that this would naturally occaſion in private families, theſe practices gave occaſion to many queſtions in law, which it belonged to the civil judges to decide ; but now theſe were all ſubjected to the authority of the patriarch : and from ſome other ſteps taken by this prelate, it appeared that he intended to encroach much farther upon the civil authority. One of theſe related to the church-lands ; which in Ethiopia are granted by the king, and reſumed at his pleaſure ; others being granted in their place, ſo that neither prieſts nor monks have any property in them. On the preſent occaſion, an Abyſſinian nobleman had poſſeſſed ſome lands belonging to a catholic monk ; for which he was called before the patriarch. On his refuſing to ſubmit to this new tribunal, he was inſtantly condemned to reſtore the lands ; but refuſing this alſo, the patriarch took an opportunity, as he was attending the emperor at church, to pronounce ſentence of excommunication againſt him, giving him over at once, ſoul and body, to the devil.—On hearing this terrible ſentence pronounced, the nobleman fainted away, and was with difficulty recovered. On the interceſſion of the emperor, however, the curſe was taken off ; but the incident produced a very diſagreeable effect on the minds of the people, who from that day began to entertain a greater averſion than ever to the Roman Catholics and their prieſts. This averſion was greatly increaſed by the abſurd conduct of the patriarch, in ordering the body of an Abyſſinian ſaint to be taken up, and thrown out of the grave in an ignominious manner, becauſe it had been buried under the altar of a church, which he imagined was thus defiled. In all other reſpects, the patriarch behaved in ſuch an inſolent and overbearing manner, that the effects of his oppreſſion ſoon began to be univerſally felt, and the Catholic religion began very quickly to decline.—The firſt ſtroke given to it was the alteration of the liturgy ; which was done at the deſire of the emperor. Ever ſince the eſtabliſhment of the Catholic religion, the Latin maſs-book, &c. had been made uſe of according to the practice of the church of Rome ; but as it ſeemed very unreaſonable to impoſe this at once upon the Ethiopians, Socinios ordered the patriarch to make ſuch alterations in the old Abyſſinian liturgies as he thought proper, that the people might thus have an opportunity of paying their devotions in a language they underſtood. The patriarch, not being able to aſſign any ſolid reaſon to the contrary, was obliged to comply ; but no ſooner was this done than the people made uſe of their old liturgies entirely, without the leaſt regard to the innovations of the patriarch. In the midſt of the confuſion which daily took place from theſe cauſes, the Galla made a dreadful invaſion, and cut off one of the emperor's generals with his whole army : nor were all the abilities of Sela Chriſtos, who had ſo often diſtinguiſhed himſelf, ſufficient to retrieve matters ; ſo that the ſavages, after having ravaged the country for ſome time at pleaſure, returned home loaded with booty. This misfortune was followed by the revolt of Tecla Georgis the king's ſon-in-law ; who not only made religion the pretence for taking up arms, but inſulted the Catholics in the moſt outrageous manner ; collecting their images and other religious trinkets into an heap, and then publicly ſetting fire to them. After this he called before him his own chaplain, named *Abba Jacob*, who was a Catholic, ſtripped him of his pontificals, and killed him with his own hand. A reconciliation with Socinios was now impoſſible ; ſo that he had no reſource but in arms. In this,

248 An Abyſſ nian nobl man excom municate

249 Body of a Abyſſinian ſaint thrown out of the grave.

250 Catholic liturgy altered.

251 An army cut off by the Galla.

252 TeclaGeo gis, the king's ſon in-law, re volts.

253
defeated,
en, and
cuted.

this, however, he was equally unſucceſsful with the other rebels in this reign; being defeated, taken priſoner, and put to death along with his ſiſter Abdera, notwithſtanding the interceſſion of a Catholic miſſionary for him, and that of the queen and ladies of the court for his ſiſter.

As the reaſons given by the king for refuſing ſuch powerful interceſſion were purely religious, the people became more and more averſe to a profeſſion ſo extremely oppreſſive and ſanguinary as that of Rome ſeemed to be.

254
volt of
e Agows.
ho ſet up
Melcha
hriſtos.

A revolt of the Agows quickly followed; not that religion had really any ſhare in their determinations, but that they were exaſperated by the ſlavery and oppreſſion to which they ſaw themſelves ſubjected. They now therefore ſet up Melcha Chriſtos, a prince of the royal blood, as a pretender to the crown; and ſoon put on ſuch a formidable appearance, that the king himſelf thought proper to march againſt them with an army of 30,000 fighting men, which with the ſervants and other attendants amounted to more than 80,000. Melca Chriſtos retired with his troops to the craggy mountains of the country; and being imprudently followed by the emperor, rolled down ſuch quantities of ſtones from the precipices, that Socinios was obliged to retreat with great precipitation, after having loſt almoſt one half of his army.

255
he rebels
efeated by
ela Chri-
os.

On this defeat the emperor found himſelf obliged to apply to Sela Chriſtos, whom he had again diſgraced and deprived of his government.

256
æca Ma-
iam's re-
olt and
eath.

He ſucceeded in giving the rebels a dreadful overthrow, which for ſome time entirely broke their power; but this ſucceſs was quickly followed by the revolt of Læca Mariam, a near relation of the king. He alſo was defeated, and obliged to retire to a mountain ſo ſteep, that though he aſcended it in ſafety, he was daſhed in pieces with many of his followers in attempting to deſcend; the reſt, who eſcaped this danger, being killed by their purſuers.

257
everal
isfortunes
efal the
mperor.

Still, however, the rebel Melca Chriſtos was unſubdued; againſt whom Prince Facilidas, the heir apparent to the throne, was ſent, having under him a nobleman of moſt diſtinguiſhed character named *Keba Chriſtos*. The latter was defeated and killed, without its being in the power of Facilidas to do any thing towards the ſuppreſſion of the rebellion. This misfortune was followed by the death of Fecur Egzie, formerly ambaſſador with Antonio Fernandes to the pope, but now lieutenant-general to Sela Chriſtos. He was cut off with a ſmall body of troops by the Galla; and from many misfortunes befalling the imperial troops, the power of Melca Chriſtos was augmented to ſuch a degree, that he now began to act as a king, and appointed a deputy-governor to one of the provinces.

258
rebel ge-
eral en-
rely de-
ated

His opinion of his own importance, however, had almoſt proved his ruin; for the new governor having appointed a great feſtival on a Saturday, in oppoſition to the royal edict, he was attacked by a party of the king's troops, and entirely routed with the loſs of 4000 of his men.

259
rince Fa-
lidas de
ated.

This defeat was revenged by an overthrow given to Prince Facilidas himſelf; the blame of which was laid upon Sela Chriſtos. The latter, as we have often had occaſion to obſerve, was not only a moſt valiant commander, but a rigid Catholic; and theſe two properties might naturally have been thought to ſecure him in favour with the emperor. His violent conduct in regard to the Catholic religion, however, had raiſed him ſo many enemies, that accuſations were perpetually brought againſt him; and one diſgrace conſtantly followed another, notwithſtanding all his ſervices.

260
Sela Chriſtos univerſally hated.

The preſent accuſation was brought by one Leſana Chriſtos, whom Sela Chriſtos had formerly condemned to death. For this offence he had received a pardon from Socinios; and he now revenged himſelf upon his former judge by accuſing him to his ſovereign. Sela Chriſtos was not unmindful of this conduct; and therefore, as ſoon as he had him in his power, put him to death without regarding the pardon he had received.

261
Deprived of the government of Gojam.

The emperor on this deprived him of the government of Gojam, which he gave to Serca Chriſtos, who was ſuppoſed to be a dependent on Prince Facilidas, and was beſides couſin to the emperor himſelf.

262
Revolt of the new governor.

The new governor, on his entering upon office, promiſed ſolemnly to ſupport the Catholic religion; but no ſooner did he arrive in Gojam, than he ſolicited Prince Facilidas to rebel againſt his father, and re-eſtabliſh the Alexandrian faith. This was not the only inſtance in which he ſhowed his diſobedience. He had received the charge of a caravan which came annually from Narea; but inſtead of acting properly in this reſpect. he employed himſelf in driving off the cattle of the Agows and Damots, who expected no harm, and were conſequently quite unprepared. Such numbers of them were carried off on this occaſion, that 100,000 are ſaid to have been ſent to the Abyſſinian market. Socinios, when informed of ſuch an atrocious robbery, ordered him to reſtore the cattle, and to ſurrender himſelf priſoner; but inſtead of complying with this order, he again ſolicited Facilidas to revolt againſt his father. For this he was ſharply reproved; but now, determining to make the world believe that the prince had entered into his ſchemes, he ſent a public meſſage to him, in which he was deſired to come and take poſſeſſion of the kingdom. Facilidas impriſoned the perſon who brought this treaſonable meſſage, and ſoon after ſent him to Socinios; but Serca Chriſtos ſtill perſiſted in his mad attempts. He now propoſed to aboliſh the Romiſh religion throughout the kingdom; and with that view attacked a convent which Sela Chriſtos had built in Gojam: but the fathers having been furniſhed with ſome fire-arms, made ſo good a defence, that he was obliged to give over the enterprize. He then took the laſt ſtep to complete his folly, by openly revolting againſt the emperor, and ſetting up a prince of the blood-royal in oppoſition to him, whom he had found living in obſcurity among his mother's relations. To cut off all poſſibility of reconciliation with the emperor, he renewed the ſacrilegious practices of Georgis, and put to death a prieſt for refuſing to deny the two natures of Chriſt. Thus he procured a multitude of enthuſiaſts to join him; but when the affair came to a deciſion, and Prince Facilidas with a well diſciplined army was ſent again him, it then became evident how little the fanaticiſm of a tumultuous rabble availed againſt the ſkill of a regular army.

263
He is defeated, taken, and put to death.

The rebels fought, however, with great obſtinacy till moſt of them were killed, their commander being obliged to take refuge on a mountain; from whence being unable to make his eſcape, he at laſt came down and ſurrendered at diſcretion. We need not doubt of his fate; but notwithſtanding the execution of this rebel, another ſtill remained. This was Melca Chriſtos, againſt whom the emperor next prepared to march. He now found, however, the bad conſequences of having acted ſo violently in favour of the Catholic religion. His army was ſo diſaffected, that he could ſcarcely put any confidence in them.

264
The emperor relaxes in his ſeverity concerning religion, which is reſented by the patriarch.

For this reaſon he iſſued a proclamation, that ſuch as choſe to obſerve the Wedneſday as a faſt inſtead of Saturday, had liberty to do ſo. This and ſome other indulgencies being reported to the patriarch, the latter ſharply reproved him as committing an encroachment on the prieſthood; and put him in mind of the puniſhment of leproſy inflicted upon Uzziah for aſſuming the prieſt's office. Thus an altercation commenced; and it was evident, from the behaviour of Socinios, that his extreme favour for the Romiſh religion began to decline. After this he ſet out for the country of Laſta, where Melcha Chriſtos was; and the entrance to which was guarded by very high and rugged mountains. Among theſe the rebels had ſtrongly fortified themſelves; but were driven from four poſts by the king's troops, ſo that the latter imagined a complete victory had been gained. Aſſembling themſelves, however, on the top of another high mountain, the rebels watched their opportunity; and deſcending ſuddenly upon them, cut off great numbers, and obliged the reſt to make a precipitate retreat.

265
The emperor defeated.

Another campaign was therefore neceſſary; but now the army loſt all patience. They were become weary of making war on their countrymen; and, after ſlaughtering them in the field, ſeeing the intervals between the campaigns filled up with numerous executions of thoſe who had eſcaped the ſword.

266
The army require the reſtoration of the Alexandrian faith.

A deputation was therefore ſent from the ſoldiers by Prince Facilidas, who, though he had never declared his ſentiments openly, was ſtrongly ſuſpected of being no friend to the Catholics. The purport of the deputation was, that they did not mean to ſay that the Romiſh profeſſion was a bad one, but it was ſuch as they could not underſtand; and conſequently there could be no merit on their part in profeſſing it. They were ready, however, to lay down their lives for the public good, provided their ancient religion was reſtored; but this was a point they would not give up, and without which they would neither concern themſelves in the quarrel, nor even wiſh ſucceſs to the emperor's arms. With regard to the Romiſh religion, they added this declaration, perhaps the ſtrongeſt poſſible mark of averſion, that they did not *wiſh* to know any thing about it. Socinios, therefore, according to the Abyſſinian accounts, promiſed to reſtore the Alexandrian faith, on condition that he returned victorious from Laſta. The army then readily agreed to follow him wherever he pleaſed; while the rebels, having left their fortreſſes in Laſta, probably from a confidence in their own ſtrength, boldly marched towards the royal army. In the engagement, however, they did not ſhow their uſual alacrity, and were ſoon defeated with the loſs of 8000 men.

267
Melca Chriſtos defeated.

Many of their beſt officers were killed on the ſpot, and Melca Chriſtos himſelf eſcaped only by the ſwiftneſs of his horſe.

By this victory the power of the rebels was broken; but it was not attended with the ſame ſatisfaction to the people with which other victories were wont to be accompanied. On viewing the field of battle along with Facilidas next day, the prince is ſaid to have made a pathetic ſpeech to his father; in which he told him, that the bodies of the men he ſaw dead on the field of battle were neither thoſe of Pagans nor Mohammedans, but of his own Chriſtian ſubjects; and that victories of this kind were like driving a ſword into his own entrails. "* How many men (ſays he) have you ſlaughtered? how many more have you yet to kill? We are become a proverb even to the Pagans and Moors for carrying on this war; and for apoſtatizing, as they ſay, from the faith of our anceſtors."

268
Pathetic ſpeech of prince F
cilidas to his father concernin
the war.

The king did not make any reply at that time; but the effects of the prince's words were ſoon apparent. The patriarch took the firſt opportunity of upbraiding him with his ingratitude to the Catholics, and deſerting the religion whoſe profeſſors had by their prayers obtained ſuch a ſignal victory. To this Socinios replied in general, that he had done every thing in his power to eſtabliſh the Catholic religion; for which he had ſhed the blood of thouſands, and had ſtill as much more to ſhed: but that he ſhould conſider of the matter, and acquaint him with his final reſolution. This was by no means favourable; for next day, in a meſſage to the patriarch, he recounted the many rebellions which had been excited on account of religion; and concluded with telling him, that though the faith of Rome was not a bad one, yet the people of Abyſſinia did not underſtand it.

269
An unive
ſal toleration gran
ed.

For this reaſon he was determined to grant a toleration, by allowing ſuch as profeſſed the Catholic faith to do ſo in peace, and ſuch as rather choſe that of Alexandria to do the ſame.

270
Oppoſed
the patriarch.

The patriarch replied, that he had no objection to grant this indulgence to ſuch as had not yet embraced the Catholic faith; but thoſe who had done ſo could not be permitted to renounce it without a grievous ſin. Thus a new ſyſtem of perſecution would have commenced: but the emperor, underſtanding well the purport of his diſcourſe, replied, that if this was the caſe, he was no longer maſter of his own kingdom; and immediately afterwards iſſued a proclamation, wherein he declared the Alexandrian faith reſtored, with the altars for the ſacrament, liturgy, and every other thing belonging to it; at the ſame time, that being now old and infirm, he himſelf reſigned the crown and empire to Facilidas.

271
The emp
ror reſtor
the Alex
andria
faith, and
reſigns th
kingdom.

This remarkable proclamation was made on the 14th of June 1632; after which Socinios took no farther care of publick affairs, nor did he long ſurvive this tranſaction. He died on the 7th of September this year, and with him fell all the hopes of the Jeſuits.

272
The new
emperor
an enemy
to the Ro
mans.

Facilidas, as had been rightly conjectured, was an inveterate enemy to the Catholic faith. As ſoon therefore as he had obtained the government, even before he took upon himſelf the title of king, the Catholics were every where diſplaced from offices of truſt and honour; but as ſoon as he found himſelf eſtabliſhed on the throne, a letter was ſent to the patriarch, informing him, that as the Alexandrian faith was now reſtored, it was become indiſpenſably neceſſary for him to leave the kingdom, eſpecially as the new Abuna was on the way, and only deferred his journey till the Romiſh prieſts ſhould be out of the country.

273
The patri
arch com
manded t
quit Aby
ſinia.

For this reaſon he commanded the patriarch, with all his brethren, to leave their convents throughout the empire, and retire to Fremona in the kingdom of Tigré, there to wait his further pleaſure. The patriarch attempted to ſoft-

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* Bruce's Travels, vo
ii. 943. p.

en him by many conceſſions, but in vain; on the 9th of March 1633 he was ordered, with the reſt of the fathers, to proceed immediately for Fremona. This they were obliged to comply with; but the emperor, underſtanding that they were about to eſtabliſh themſelves, and to ſolicit ſuccours from Spain to accompliſh their purpoſes by force, he ſent orders to the patriarch inſtantly to deliver up all the gun-powder they had at that place, and to prepare without delay to ſet out for Maſuah. Still the infatuated and obſtinate prieſt determined not to comply with the emperor's orders. At laſt he thought proper to deliver up the gun-powder; but reſolved to leave his companions behind him, and to diſperſe them as much as poſſible through the empire, in caſe he himſelf ſhould be obliged to embark at Maſuah; which, however, he did not by any means intend.

274
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n to the
harna-
ſh, then
rebellion.

For this purpoſe he applied to the Baharnagaſh, named *John Akay*, then in rebellion againſt the emperor; who carried them all off from Fremona in the night-time, under a guard of ſoldiers, and lodged them ſafely in a ſtrong fortreſs named *Adicotta*. Here the patriarch imagined that he might remain in ſafety till he ſhould be able to procure ſuccours from India. In this, however, he was deceived. John conveyed them from place to place, through many unwholeſome ſituations, till their ſtrength as well as their patience was exhauſted. At laſt, on receiving a preſent of gold, he allowed them to return to their old habitation Adicotta. Facilidas, then, being determined at all events to get rid of ſuch troubleſome gueſts, endeavoured to prevail upon John by bribes to deliver them into his hands. John was too delicate to comply with this requeſt, which he ſuppoſed would be a violation of hoſpitality; but he conſented, on receiving a proper compenſation, to ſell them to the Turks.

275
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er miſſio-
aries ſold
the
urks.

Two were left in Abyſſinia, in hopes of ſoon ſharing the crown of martyrdom; and this indeed Facilidas did not delay to put them in poſſeſſion of, both being ordered for execution as ſoon as he got them into his power. Not content with this, and being perpetually apprehenſive of freſh invaſions from Europe, he entered into a treaty with the Turkiſh baſhaws to keep the ports of Maſuah and Suakem ſhut againſt them; by which their entrance into Abyſſinia would be effectually prevented.

During theſe tranſactions, the emperor took the moſt effectual methods otherwiſe to eradicate the Romiſh religion, by cutting off the principal perſons who profeſſed it, or obliging them to renounce their profeſſion.

276
ela Chri-
os put to
ath.

The principal of theſe was his uncle Sela Chriſtos, who had deſerved ſo well of the late emperor Socinios, and of the whole empire in general. His exceſſive bigotry in religious matters proved the cauſe of his deſtruction, as has formerly been hinted. When it was propoſed to him to renounce his faith, he abſolutely refuſed to do ſo, either to avoid the greateſt puniſhment the king could inflict, or to obtain the greateſt gift he had in his power to beſtow. On this he was baniſhed to an unwholeſome diſtrict among the mountains of Samen; but as even here he kept up a correſpondence with the Jeſuits, and wiſhed to facilitate the introduction of more Portugueſe from India, he was ſentenced to be hanged on a cedar-tree.

The expulſion of the preſent race of miſſionaries did not entirely diſcourage the Europeans from attempting to introduce a freſh miſſion into Abyſſinia. The obſtinate, haughty, and rebellious ſpirit of the Jeſuits was univerſally condemned, and looked upon to be the cauſe of the extreme averſion ſhowed by the emperor and the whole empire againſt the doctrines they profeſſed. It was therefore hoped, and not without ſome appearance of reaſon, that the point might ſtill be gained, provided the miſſion were undertaken by others leſs violent and inſidious in their behaviour.

277
A new miſ-
ſion under-
taken by ſix
Franciſcan
Capuchins.

After the execution of thoſe who remained in Abyſſinia, ſix Capuchins, the reformed order of St Francis, were ſent with protections from the Grand Signior to facilitate their paſſage into Abyſſinia, where they hoped to revive the drooping or rather loſt cauſe of the Catholic religion. Nothing, however, could be more unfortunate than the event of this undertaking.

278
Four of
them mur-
dered, and
the other
two return.

The Galla murdered two who attempted to enter Abyſſinia by the way of Magadoxa. Two who arrived ſafely in the country, were ſtoned to death; while the remaining two, hearing at Maſuah of the fate of their companions, returned home with an account of it.

270
Three
others mur-
dered by
order of Fa-
cilidas.

The bad ſucceſs of theſe did not deter three others from making the ſame attempt a ſhort time afterwards; but they having imprudently informed Facilidas of their intention, were murdered by the baſhaw of Maſuah, who had received orders from him to this purpoſe. So particular was the emperor with regard to the execution of this order, that he cauſed the baſhaw to ſend him the ſkin of their faces and heads; that he might know by their faces that they were Europeans, and by their ſhaved heads that they were prieſts.

280
Melca Criſ-
tos ſtill con-
tinues in re-
bellion.

Though the Catholic faith was now totally ſuppreſſed, the ſpirit of rebellion ſtill continued; and Melca Chriſtos continued as much in oppoſition to his ſovereign as when he firſt took up arms on pretence of religion. At firſt he met with extraordinary ſucceſs; totally defeated the royal army, though commanded by Facilidas in perſon: after which, purſuing his good fortune, he made himſelf maſter of the capital, entered the palace, and was formally crowned king. This, however, was the laſt of his good fortune. Facilidas having recruited his army as faſt as poſſible, ſent three able generals to attack his rival, who was now acting the ſovereign in his palace.

281
Is defeated
and killed.

The rebels were ſurrounded before they expected any enemy, and almoſt entirely cut off, Melca Chriſtos himſelf being killed in the engagement.

The victory over Melca Chriſtos was followed by ſeveral ſucceſsful expeditions againſt the Agows and Galla; but in the 6th year of the reign of this emperor, the rebels of Laſta, who ſeemed determined not to yield while there remained a poſſibility of reſiſtance, choſe the ſon of Melca Chriſtos for their king, and again began their depredations on the neighbouring provinces.

282
The rebels
chooſe his
ſon for their
leader.

283
The empe-
ror's army
periſhes
with cold.

Facilidas marched againſt them with his uſual activity; but had the misfortune to loſe the greateſt part of his army by cold among the mountains of Laſta, though it was then the time of the equinox, and conſequently the ſun was only 12° from being vertical, the latitude of Laſta being no more than 12°, and the ſun 12 hours in the day above the horizon.—Before this rebellion could be ſuppreſſed, another was begun, at the head of which was Claudius the king's brother. He had not the ſame good fortune with the rebels of Laſta; but was quickly defeated, taken priſoner,

ſoner, and baniſhed to a mountain called *Wechne*; which ſerved from that time for the impriſonment of the princes of the blood-royal. The ſuppreſſion of one rebellion, however, ſeemed to have no other effect than that of giving riſe to another. A new expedition was to be undertaken againſt the Agows and Shangalla; but they had poſted themſelves ſo advantageouſly, that the royal army was entirely defeated without being able to make any impreſſion on their enemies. Facilidas, however, knowing that this defeat could be attended with no other bad conſequence than the loſs of the men, which had already happened, marched directly againſt the rebels of Laſta without attempting to revenge the defeat he had ſuſtained. The rebel general, weary of contention, in which he probably ſaw that he would be finally unſucceſsful, choſe to ſubmit unconditionally to the emperor; who, though he at firſt affected to treat him with ſeverity, ſoon after releaſed him from priſon, beſtowing upon him large poſſeſſions in Begemder, with his daughter Theoclea in marriage.

284
Princes of the blood again impriſoned on a mountain.

285
Facilidas defeated by the Agows and Shangalla.

286
The rebels of Laſta ſubmit.

287
Reign of Hannes.

Facilidas died in the month of October 1665, and was ſucceeded by his ſon Hannes. This prince was ſuch an enthuſiaſt for Chriſtianity, that in the very beginning of his reign he iſſued a proclamation forbidding the Mahometans to eat any fleſh but what was killed by Chriſtians; but ſo far was he from any inclination to favour the Catholics, that he ordered all their books which could be found in the empire, to be collected in a heap and burnt. Much of his time was ſpent in regulations of church-matters, and in contentions and trifling diſputes with the clergy; which conduct ſo diſguſted his ſon Yaſous, that he fled twice from the capital, but was purſued and brought back. The laſt time was in the year 1680, when he found his father ill of the diſtemper of which he died. Hannes expired on the 19th of July that year, having lived at peace during the whole of his reign, excepting ſome trifling expeditions againſt the Shangalla and rebels of Laſta.

288
Reign of Yaſous.

Yaſous, who ſucceeded to the throne with the approbation of the whole kingdom, was of a very different diſpoſition from his father; being generous, active, and brave to a great degree; he was alſo much leſs bigoted, and differed from him conſiderably in religious principles. Having ſettled church-matters as he thought proper, his next ſtep, and the moſt glorious action of his whole reign, was to pay a viſit to thoſe of the royal family who were confined on the mountain of Wachne. He found them in the moſt miſerable condition; all in tatters, and many almoſt naked; their revenue having been ill-paid by his father, who was of a ſordid diſpoſition, and the little they received having been embezzled by their keepers. Yaſous being greatly moved at this ſpectacle, ordered a large ſum of money to be divided among them for their preſent neceſſities, clothed them according to their rank, and ſettled matters ſo that no part of their revenue could ever afterwards be applied to improper purpoſes. To the governor of the mountain he aſſigned a large tract of territory, to make amends for the profit he had been accuſtomed to derive from the revenue of the princes; and finally, he left all the priſoners at the foot of the mountain, at perfect liberty either to take up their reſidence again on it or any where elſe. By theſe extraordinary inſtances of royal munificence the emperor ſo effectually gained the affection of his relations, that they unanimouſly determined to return to their former ſtate of confinement; and during the whole time of his reign no competitor for the crown ever made his appearance from among thoſe who reſided there.

289
His generoſity to the baniſhed princes.

Though Yaſous is ſaid to have poſſeſſed all the qualities which conſtitute a great and good monarch, the natural turbulence of his ſubjects, and the peſtilent diſpoſition of the monks, ſoon began to ſhow themſelves by new ſeditions. Theſe were preceded by a violent irruption of the Galla, who were overthrown, as uſual, with great ſlaughter; but ſoon after, being ſolicited by ſome monks who had drawn over a party of the Agows to their ſide, the diſturbances were renewed. A grandſon of Socinios, who had fled to the Galla when Facilidas firſt baniſhed the princes to Wechne, was proclaimed king. A multitude of ſavages immediately flocked to his ſtandard, ſo that he was ſoon at the head of a very formidable army, while the Agows and other malcontents were ready to join him as ſoon as he ſhould repaſs the Nile. The king, however, entirely diſconcerted the ſcheme by his activity; for, advancing with the utmoſt celerity, he reached the banks of the Nile before the Galla on the other ſide were ready to join their allies on this ſide of it. The Agows were ſo confounded at his preſence, that they allowed him to paſs the river unmoleſted. The Galla were equally ſurpriſed at ſeeing the war transferred into their own country; and, with their uſual fickleneſs, deſerted the prince whoſe cauſe they had pretended to eſpouſe. A few remained faithful, but were utterly defeated by the forces of Yaſous; the unhappy prince himſelf, whoſe name was *Iſaac*, being taken priſoner, and put to death in the preſence of his rival. After this many great exploits were performed againſt the rebellious Agows, Galla, and other ſavages: but which, as they produced no other conſequence than that of eſtabliſhing the emperor's character for valour and ſkill in military affairs, we ſhall here paſs over; only remarking, that, in the opinion of his ſubjects, one of his campaigns was the moſt glorious ever recorded in the annals of Abyſſinia. The moſt memorable events in the preſent reign regarded religion, and a renewal of the correſpondence betwixt Europe and Abyſſinia; of which we have a particular account from Mr Bruce to the following purpoſe. About the end of the 17th century a number of Franciſcans from Italy ſettled at Cairo in Egypt, and were maintained at the expence of the fathers in Paleſtine, though pretending to be independent of their ſuperior the guardian of Jeruſalem. The latter, diſpleaſed at this method of proceeding, offered to ſupply the miſſion to Egypt entirely at the expence of Paleſtine, and likewiſe to furniſh from thence miſſionaries capable of inſtructing the people in the Chriſtian religion. This offer meeting with a favourable reception at Rome, a new ſet of miſſionaries from Jeruſalem, called by our author *Capuchins*, appeared at Cairo; from whence the Franciſcans were baniſhed, only two of them being allowed to remain in that city. The others returned to Rome; where, finding that they could not re-eſtabliſh themſelves by fair means, they had recourſe to artifice and fiction. It was now pretended, that, on the expulſion of the Jeſuits from Abyſſinia, a great number of Catholic Chriſtians had fled into the neighbouring

290
Irruption of the Ga
la, ſeditio
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monks, re
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291
Quelled
by the e
peror.

292
Attempt
to revive
the relig
ous miſſi
from Eu
rope.

bouring countries of Nubia and Sennaar, where they found themſelves ſo grievouſly oppreſſed by the Mahometans, that, without ſome ſpiritual aſſiſtance, they would be under the neceſſity of renouncing their religion. This ſtory being confirmed by the two Franciſcans who remained at Cairo, the cauſe of theſe ſuppoſed Chriſtians was eagerly eſpouſed by the religious in Italy, and a new miſſion ſet on foot at the expence of the pope for their relief, which continues to this day under the title of the *Ethiopic miſſion*. The miſſionaries had it alſo in charge to penetrate if poſſible into Abyſſinia; and to keep up, as far as was in their power, the Catholic faith, until a better opportunity ſhould offer of making an attempt to convert the whole empire. For this purpoſe a convent was procured for them at Achmim in Upper Egypt; and permiſſion was granted, notwithſtanding their former baniſhment, to ſettle two of their order at Cairo independent of the fathers of Paleſtine.

While theſe tranſactions paſſed in Italy and Egypt, Louis XIV. of France was in the height of his glory. He had attempted to rival the ancient Greeks and Romans in the magnificence of his works; but his conduct with regard to religion, his perſecution of the Proteſtants, and revocation of the edict of Nantz, had ſtigmatized him throughout the greateſt part of Europe as a bloody and mercileſs tyrant. To wipe off this ſtain, the Jeſuits, his great ſpiritual directors, formed a ſcheme of inducing the emperor of Abyſſinia to ſend an embaſſy to France; after which they hoped that they might get themſelves replaced in the Ethiopic miſſion, to the excluſion of the Franciſcans. The king, whoſe pride was very much flattered by the propoſal, readily came into it; but the Pope's conſent was ſtill neceſſary. His Holineſs was by no means pleaſed with this intruſion of a temporal prince into ſpiritual affairs: nevertheleſs, he did not chooſe to enter into any conteſt; but that he might undo with one hand what he did with the other, he appointed ſix Jeſuits, of whom Verſeau, the ambaſſador of Louis to himſelf, was one, to be miſſionaries to Abyſſinia, but the ſuperior of the Franciſcans to be his legate *à latere* at that court; providing him with ſuitable preſents for the emperor and principal nobility.

The Jeſuits now finding themſelves in danger of being ſupplanted by the Franciſcans, applied to the Pope to know which of the two orders ſhould make the firſt attempt to enter Abyſſinia; but received no other anſwer than that thoſe who were moſt expert ſhould do ſo. Verſeau, probably diſpleaſed at this conduct of the Pope, went to a convent in Syria of which he was ſuperior, without making any attempt to enter Ethiopia: therefore the miſſion remained in the hands of two perſons of oppoſite profeſſions, a Jeſuit and Franciſcan; the name of the latter being *Paſchal*, an Italian; and of the former *Brevedent*, a Frenchman. The latter was accounted a man of learning and probity, zealous in the cauſe of his religion, but by no means imprudent or raſh in his attempts to promote it.

293
Yaſous falls ſick, and ſends for an European phyſician.

In the mean time an unforeſeen accident procured admittance to the miſſionaries into Abyſſinia more readily than could have been expected in the preſent ſituation of affairs. Yaſous and his ſon had both been attacked by a ſcorbutic diſorder which threatened to turn to a leproſy; on which one Hagi Ali, a Mahometan factor at Cairo, received orders to bring with him an European phyſician on his return to Abyſſinia. It happened that this man had formerly been acquainted with Friar Paſchal, who had adminiſtered ſome medicines to him. He now propoſed that Paſchal ſhould accompany him to Abyſſinia in the character of a phyſician; and that Friar Anthony, another of his own order, ſhould go with him as his companion. But this ſcheme was fruſtrated by Maillet the French conſul, who had the charge of the whole from Louis XIV. and wiſhed that the Jeſuits alone ſhould have the conduct of the miſſion. For this purpoſe he repreſented to Hagi Ali, that friar Paſchal underſtood nothing of medicine; but he promiſed to furniſh him with another, whoſe ſkill he extolled above all thoſe of ancient or modern times. Hagi Ali, who knew nothing of the matter, readily agreed to Maillet's propoſal; and Charles Poncet a Frenchman, who had been bred a chemiſt and apothecary, was appointed to the office of phyſician, with Father Brevedent to attend him as his ſervant. Thus the ſcheme of the Franciſcans was for the preſent overthrown: but unluckily Maillet employed one Ibrahim Hanna, a Syrian, to write letters to the Abyſſinian monarch and ſome of his principal nobility, which he deſired him to ſubmit to the inſpection of one Francis a capuchin or monk of the Holy Land, and conſequently an enemy to the Franciſcans. Ibrahim, not being acquainted with the monk he mentioned, and thinking any other would anſwer as well, carried the letters to one of the ſame name, but of the Franciſcan order. Thus the whole ſecret was divulged at once; and the Franciſcans, with the malevolence eſſential to ſuch religious miſcreants, reſolved on the deſtruction of Poncet and his attendants. At preſent, however, their ſanguinary intentions were defeated; Poncet ſet out immediately after he had received his commiſſion, and arrived ſafe at Gondar the capital of Abyſſinia, with his attendant Father Brevedent, on the 21ſt of July 1699. Brevedent died on the 9th of Auguſt; but Poncet lived to execute his commiſſion, by making a full cure of his royal patient. On the 2d of May 1700, he ſet out on his return for Europe, and arrived at Maſuah without any bad accident.

294
Friar Paſcal and another Franciſcan undertake the office.

295
Diſappointed by M. Maillet.

296
Poncet and Brevedent appointed.

297
The Franciſcans reſolve the deſtruction of the miſſionaries.

298
Poncet ſets out on his return after curing Yaſous.

It has already been obſerved, that the main end of this undertaking was to procure an embaſſy from Abyſſinia to the French monarch; and this end alſo was gained. An ambaſſador was procured, but unluckily not ſuch a one as M. Maillet the chief manager of the whole project deſired. This man, intoxicated with abſurd notions of nobility and diſtinctions of rank, could not make allowance for the difference between the appearance of an ambaſſador from a barbarous monarch, however powerful, and one from the ſovereign of a civilized and polite nation. The ambaſſador ſent by Yaſous, therefore, having been originally no other than a cook, could not be agreeable to a man of ſuch a diſpoſition. The preſents ſent by the Abyſſinian monarch indeed, had they arrived, would have probably conciliated matters. Theſe were, an elephant, ſome Abyſſinian young women, &c. but unluckily the elephant died, and the ambaſſador was robbed of all the reſt by a Turkiſh baſhaw. Maillet, therefore, naturally proud, imperious, and covetous, thought pro-

299
The Abyſſinian ambaſſador diſagreeable to M Maillet.

300 He is not allowed to proceed to France.

per to call in queſtion the authenticity of Morat the ambaſſador's miſſion, to call Poncet himſelf a liar, and not to allow the former to proceed to France. The tranſactions on this occaſion are ſet forth at length by Mr Bruce, greatly to the diſgrace of Maillet; but as details of this kind would ſwell the preſent article beyond due bounds, we muſt refer the curious reader to the work juſt mentioned.

301 M. de Roule ſent ambaſſador from France.

302 He is murdered.

Thus the ſcheme of procuring an embaſſy from Abyſſinia having proved abortive, the next project of the Jeſuits was to get an embaſſy ſent from France, whoſe object was to be the cementing a perpetual peace betwixt the two nations, and to eſtabliſh a laſting and commercial intercourſe; though, whatever friendſhip or good-will might take place, it was evident that there was not a ſingle article that could be exchanged between them, nor was there any ready communication betwixt the two countries either by ſea or land. The perſon pitched upon as ambaſſador was M. de Roule, vice-conſul at Damietta. He is characteriſed by Mr Bruce as "a young man of ſome merit, who had a conſiderable degree of ambition, and a moderate ſkill of the common languages ſpoken in the eaſt; but abſolutely ignorant of that of the country to which he was going, and, what was worſe, of the cuſtoms and prejudices of the nations through which he was to paſs. Like moſt of his countrymen, he had a violent predilection for the dreſs, carriage, and manners of France, and a hearty contempt for thoſe of all other nations: this he had not addreſs enough to diſguiſe; and this endangered his life." Beſides theſe diſadvantages, he had the miſfortune to be under the diſpleaſure of all thoſe of his own nation who reſided at Cairo: ſo that the merchants were very much averſe to his embaſſy; and, as the Franciſcans and Capuchins were his mortal enemies, he had not a ſingle friend in the world except Maillet and the Jeſuits. Unluckily the conſul miſled him in one of the moſt material articles, and which was undoubtedly of the utmoſt conſequence to him in the accompliſhment of his purpoſe, viz. the preſents neceſſary to be taken with him for the barbarous people through whoſe country he was to paſs. Brocades, ſattins, and trinkets of various kinds, according to Mr Bruce, were the proper wares; but, inſtead of this, he had taken along with him mirrors of various kinds, with the pictures of the king and queen of France, wearing crowns upon their heads. The former of theſe ſubjected him to the imputation of being a magician; while the latter, if ſhown to a Mahometan, would bring upon him the charge of idolatry. The worſt misfortune of all was the malice and treachery of the Franciſcans, who had already prejudiced againſt him the people of the caravan with whom he was to go, the governors of the provinces through which his road lay, and the brutal and barbarous inhabitants of Sennaar, who lie in the way betwixt Egypt and Abyſſinia. The conſequence of all this was, that he was murdered at the laſt mentioned place with all his retinue. The Franciſcan friars, who had preceded him to Sennaar, left it before his arrival, and returned immediately after. There cannot therefore be the leaſt doubt that they were the authors of his murder; though the bigotted diſpoſition of Louis XIV. prevented all enquiry into the matter; ſo that the particular ſteps they took to accompliſh their deſigns were never publiſhed to the world.

303 Yaſous aſſaſſinated.

304 The new emperor intends to revenge his death;

305 But is himſelf murdered.

The aſſaſſination of de Roule was preceded by that of Yaſous emperor of Abyſſinia, who fell by a conſpiracy of his wife and ſon, occaſioned by a fit of jealouſy in the former. He was ſucceeded by his ſon Tecla Haimanout, who had conſpired againſt him. Before his death, he had diſpatched a meſſage to the king of Sennaar, requiring him to afford M. de Roule protection at his court, and a ſafe conduct from it; but when the meſſenger was within three days journey of the capital of that kingdom, he received news of the aſſaſſination of Yaſous. On this he returned in great haſte to Gondar, in order to have the letters of protection renewed by Tecla Haimanout the reigning prince. This was readily done: but before the meſſenger could reach Sennaar, he was informed that de Roule was already aſſaſſinated; on which he returned with ſtill greater haſte than before. The Abyſſinian monarch, provoked at ſuch a ſcandalous violation of the law of nations, declared his intention of commencing hoſtilities againſt the king of Sennaar; and for this purpoſe aſſembled his army. But this was ſcarce done, before he was informed that a rival, named Amda Sion, had been ſet up againſt him by the friends of his father Yaſous, and had been for ſome time privately collecting troops to ſurpriſe him before he could be ready to make any oppoſition. It was therefore neceſſary to employ the army deſtined againſt Sennaar to reduce this rebel to obedience; and ſcarce was this done, when the emperor himſelf was aſſaſſinated; ſo that all thoughts of revenging the death of M. Roule were laid aſide.

306 Reign of Theophilus.

307 Execution of the queen and other regicides.

308 Tigi revolts but is defeated, taken and put to death.

Tecla Haimanout periſhed in 1706, and was ſucceeded by his uncle Tiffilis, or Theophilus; whoſe firſt care was to apprehend all thoſe ſuſpected to have been concerned in the death of his predeceſſor. Thus the murderers of Yaſous, whom Tecla Haimanout had inſtigated, imagined themſelves ſecure, and came to court without any fear of danger: but no ſooner did Theophilus get them into his power, than he cauſed them all to be put to death without exception; the queen herſelf being publicly hanged on a tree. Not ſatisfied with avenging the death of Yaſous by the execution of his murderers, he did the ſame with thoſe of Tecla Haimanout; putting to death all who were immediately in his own power, and commanding the governors of the provinces to do the ſame with thoſe whom they could find within their juriſdiction. One of theſe named Tigi, who had been formerly betwudet, having eſcaped into the country of the Galla, raiſed a very conſiderable army, with which he invaded Abyſſinia, where he committed the moſt dreadful cruelties. Theophilus engaged him on the 28th of March 1709; when, with a force greatly inferior, he gained a complete victory. A number of the Galla fled to a church, hoping to be protected by the ſanctity of the place; but the emperor telling his ſoldiers that it was defiled by thoſe who were in it, commanded it to be ſet on fire, ſo that every one periſhed. Tigi, with his two ſons, were taken priſoners, and put to death. The king himſelf did not long ſurvive his victory; falling ſick of a fever, of which he died in September 1709.

309
ine of So
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ide.

After the death of Theophilus, the line of Solomon by the queen of Sheba was ſuperſeded a ſecond time, and a ſtranger of the name of *Ouſtas* ſeated on the Abyſſinian throne. The extreme ſeverity of Theophilus in puniſhing the murderers of both Yaſous and Tecla Haimanout gave occaſion to this; for as both princes had been aſſaſſinated in conſequence of conſpiracies formed by the principal people of the nation, the number of conſpirators was ſo great, that the parties concerned had intereſt ſufficient to influence the election of the new monarch even in this moſt capital reſpect, of his not being a deſcendant of Solomon. Excepting this ſingle defect, he was in every reſpect worthy of the kingdom, and was already the higheſt ſubject in it. Scarce was he ſeated on the throne, however, when a dangerous conſpiracy was formed againſt him by the very perſons by whom he had been placed upon it. Ouſtas baffled their deſigns, by ſeizing the principal conſpirators before they had time to bring their ſchemes to a bearing; and ſeveral people of the firſt rank were condemned to loſe their noſes, or to be put to death. After this the emperor undertook an expedition againſt the Shangalla, according to the barbarous cuſtom of the Abyſſinian monarchs, who hunt theſe poor people merely for the ſake of making ſlaves; ſlaughtering the men without mercy as well as many of the women, and carrying off only the boys and girls into captivity. In this he met with perfect ſucceſs; and was about to attempt the conqueſt of the whole country, when he was called back by the news that his prime miniſter Tafa Chriſtos was dead.

310
he empe-
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While the emperor remained in his capital at Gondar, he was taken ſuddenly ill; which he at firſt imputed to witchcraft, and therefore uſed ſome antidotes; among which the ſmoking of the palace with gun-powder was one. But this was done ſo careleſsly by the ſervants, that the whole building was conſumed; an accident looked upon by the people in general as a very bad omen, eſpecially as the king's complaint increaſed every day. At laſt the principal officers came to pay him a viſit of condolence, as they pretended; but in reality to obſerve the nature of his diſtemper, and to conſult whether or not it was likely to continue till they could fall upon means to deprive him of the government. Ouſtas underſtood their intentions, and therefore ſummoned all his ſtrength to put on for a moment the appearance of health; ſo that the officers found him attending buſineſs as uſual. Being thus diſconcerted, it became neceſſary to make ſome apology for a viſit ſo extraordinary and formal; for which they were at firſt ſomewhat at a loſs: on recollection, however, they told him, that, hearing he had been ſick, which they happily found was not the caſe, they had come to make a propoſal concerning the ſucceſſion; profeſſing a deſire that he would quiet the minds of his own family, and of the people in general, by appointing his ſon Faſil ſucceſſor to the throne after his deceaſe.

311
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Ouſtas gave them an equivocal anſwer; but the diſcourſe concerning Faſil happening to be overheard by the ſoldiers, a violent mutiny enſued, and all the officers who had come to viſit Ouſtas were killed. Part of the town was ſet on fire in the confuſion; and at laſt a proclamation was made, that David ſon of Yaſous was king of Abyſſinia. The prince was then ſent for from the mountain, and arriving at Gondar was crowned on the 30th of January 1714. The diſtemper of Ouſtas in the mean time continuing to increaſe, he died on the 10th of February the ſame year.

312
Death of
Ouſtas.

313
Reign of
David.

The new emperor was a rigid Alexandrian in principle; but Ouſtas had been ſo far favourable to the Catholics, as to entertain ſome of their prieſts, though in a private manner. As it was the cuſtom, however, to call a convocation of the clergy on the acceſſion of every new emperor, the monks and others inſiſted upon one being called on the preſent occaſion; the more eſpecially that a new abuna was come from Egypt, and the lenity ſhown to the Catholics by Ouſtas had excited the jealouſy of the Abyſſinian clergy in the higheſt degree. This aſſembly proved fatal to three Romiſh prieſts, whom Ouſtas had protected and ſupported for ſome time. They were brought before the king and Abyſſinian clergy; who ſhortly aſked them, whether they believed that the council of Chalcedon was to be accepted as a rule of faith, and that Pope Leo lawfully preſided in it? To both theſe queſtions they anſwered in the affirmative: on which, without more trial, they were condemned to be ſtoned; and the ſentence was inſtantly put in execution by the furious and ignorant multitude, only one perſon in the whole aſſembly exclaiming againſt it as unjuſt. The prieſts being thus gratified in one inſtance, inſiſted that Abba Gregorius, who had acted as an interpreter to the three juſt mentioned, ſhould alſo be put to death; but this was prevented by David, who found, upon inquiry, that he had only done ſo in obedience to the expreſs commands of Ouſtas his ſovereign.

314
Three Romiſh prieſts
executed.

Here we muſt take notice, that though the faith of Abyſſinia is always ſaid to be the ſame with that of Alexandria, it is not for that reaſon to be imagined that the clergy are all of the ſame mind. On the contrary, many different parties exiſt among them, who hate one another no leſs than all of them do the church of Rome. The principal of theſe in the time we ſpeak of were the monks of Debra Libanos and thoſe of St Euſtathius, to which laſt the emperor himſelf belonged. On the arrival of a new abuna, it is cuſtomary to interrogate him before the emperor and aſſembly of the clergy, which of the two opinions he adheres to. The emperor at preſent, not thinking his preſence neceſſary, ſent the betwudet with the principal perſons of both parties to hear the profeſſion of the new abuna, which was afterwards to be proclaimed to the people. The latter, probably not willing to contend with either party, gave an equivocal anſwer. But with this the king himſelf was diſſatisfied; and therefore, without conſulting the abuna farther, he cauſed it to be proclaimed, that the new abuna's profeſſion was the ſame with that of the monks of St Euſtathius. This was highly reſented by the monks of Debra Libanos, who inſtantly ran to the abuna, and from him received a profeſſion directly contrary to what had been proclaimed by the king's order.

315
Diſſenſions
among the
Abyſſinian
clergy.

Not ſatisfied with this, they continued their tumult, diſregarding the imminent danger they were in of falling under the king's diſpleaſure. One of their number was ſo infatuated as to cry out, that he ſaw a cherub with a flaming ſword guarding the door of the houſe where they were. Unluckily, however, they continued their aſſembly ſo long, and behaved in ſuch a ſeditious manner, that the emperor ſent againſt them a body of pagan Galla; who falling upon them ſword in hand, killed upwards of 100 of the ringleaders, and then ſallying out into the ſtreet deſtroyed indiſcriminately every one they met.

316 Great maſſacre of the clergy and others.

The maſſacre continued till the next day at noon, when a ſtop was put to it by the king's proclamation. The vaſt quantity of blood ſo wantonly ſhed, however, could not but occaſion great diſcontent throughout the capital, and the bad effects of it ſoon appeared.

317 The king poiſoned.

The king was univerſally hated, and numberleſs conſpiracies were talked of; but before any pretender to the crown appeared, David himſelf fell ſick, the cauſe of which was found to be poiſon. The perpetrators of this crime being known, were inſtantly put to death; but nothing could ſave the life of the emperor, who died the 9th of March 1719 in great agony.

318 Reign of Bacuffa.

David was ſucceeded by his brother Bacuffa; who in the beginning of his reign proved very ſevere and cruel, cutting off almoſt all the nobility who could be ſuppoſed to have had any ſhare in the conſpiracies and ſeditions of former reigns. In the latter part of it he became much more mild, and was beloved by his ſubjects.

319 Of Yaſous II.

He was ſucceeded in 1729 by his ſon Yaſous II. who continued long under the regency of his mother; and as ſoon as he took the management of affairs upon himſelf, was diſturbed with continual ſeditions and rebellions. In one of theſe the city of Gondar was made a field of battle, and was ſo frequently ſet on fire, as to be almoſt entirely reduced to ruins.

320 Applies himſelf to the arts of peace.

Having at laſt ſucceeded in reducing all his enemies to obedience, he applied himſelf to the arts of peace, repairing and ornamenting his palaces, in which he employed ſome Greek artiſts.

321 Is ridiculed by his ſubjects, and undertakes an expedition againſt Sennaar.

For this he renounced the diverſion of hunting, and the barbarous expeditions againſt the Shangalla; but this way of life proved ſo diſagreeable to his turbulent ſubjects, that a ſevere ſatire was publiſhed againſt him under the title of "The expeditions of Yaſous the Little." Nettled at this reproach, he determined on an expedition againſt the kingdom of Sennaar; and having made the neceſſary preparations, invaded it with a formidable army, without the leaſt pretence of provocation, or making any declaration of war. As he proceeded into the country of the enemy, he allowed his ſoldiers every where to exerciſe the greateſt cruelties, to deſtroy every living creature with the ſword, and every thing combuſtible with fire. Some of the Arabs joined him as he went along; many more fled from his preſence; and a body of them tried to oppoſe him. Theſe laſt were utterly defeated; and Yaſous without delay prepared to march to Sennaar the capital of the kingdom.

322 A diviſion of his army cut off.

As he ſtill went on, the king Baady being aſſiſted by Hamis prince of a territory named *Dar Fowr*, ſurpriſed one diviſion of his army ſo effectually, that they were all cut off to the number of 18,000. Yaſous, however, ſtill continued his deſtructive progreſs; though he gave over all thoughts of reducing the capital, or ſubduing the kingdom. He returned triumphant to Gondar, making a great ſhow of the plunder he had acquired; though the dejected countenances of many of his army ſhowed that they were by no means pleaſed with expeditions of this kind. The king himſelf was ſuppoſed to behold the diſtreſs of his ſubjects on this occaſion with a malicious pleaſure, on account of their impatience and turbulence in times of peace, and their forcing him into a war when he had no inclination for it. In a ſhort time, however, the people were perfectly comforted for the loſs of their brethren.

323 Religious utenſils redeemed at an extravagant rate.

In the late unfortunate action they had loſt all thoſe holy utenſils, which it is uſual in Abyſſinia to carry into the field of battle in order to enſure victory. Among theſe was a true picture of the crown of thorns which was put upon our Saviour's head; ſome pieces of the croſs upon which he ſuffered; a crucifix which had ſpoken on many occaſions; with many other ſacred relics of equal value. Soon after the battle all theſe were redeemed by the prieſts at an extravagant rate; no leſs than 8000 ounces of gold having been given for the ſpeaking crucifix; and for the reſt, we are to ſuppoſe a proportional price had been paid. On the arrival of this trumpery at Gondar, the greateſt rejoicings were made, and Yaſous was aſtoniſhed at the people having ſo ſoon forgot the loſs of their countrymen and relations.

324 The meſſengers ſen for the ne Abuna inſulted and robbed.

Soon after theſe tranſactions the abuna died; but though it was cuſtomary for the Abyſſinian monarchs to advance the money neceſſary to bring a new one from Alexandria, Yaſous found himſelf obliged to lay a tax upon the churches for defraying it at this time, having ſpent all his ready money in repairing and ornamenting his palaces. Three prieſts, conſigned to the care of as many Mahometan factors, were ſent to Egypt for the new patriarch; but they were detained for ſome time by the naybe or prince of Maſuah, who extorted from them one half of the money given by the emperor for bringing the abuna from Cairo. Yaſous no ſooner heard that they were detained at Maſuah, than he ſent orders to Suhul Michael governor of Tigré to refuſe proviſions to the inhabitants of Maſuah, which would ſoon reduce the naybe to obedience: but as Michael intended ſoon to quarrel with the king himſelf, he was not in any haſte to obey the orders he received. The travellers were therefore detained ſo long, that on their arrival at Jidda, they found they had loſt the monſoon; and, what was worſe, the ſcherif of Mecca would not allow them to paſs without a freſh extortion. Their money was now exhauſted; but the rapacious ſcherif put one of their number in priſon, where he continued for a twelvemonth till the money arrived:

325 A ſtated tribute for the paſſage of the Abuna.

and from this time theſe extortions were changed into a ſtated tribute; 75 ounces of gold (about L. 186 ſterling) being granted for leave of paſſage to Cairo for the abuna; 90 ounces to the ſcherif, and as many to the naybe, for allowing the abuna to paſs from Cairo; an agreement which ſubſiſts to this day. Several other inſults of this kind being received from the naybe, Yaſous at laſt diſcovered that there was a ſtrict alliance betwixt him, the governor of Tigré, and the Baharnagaſh; any one of whom, had he thought proper, could have cruſhed this pitiful prince with the ſmalleſt effort

326 The emperor determines to puniſh the Naybe of Maſuah, but is prevented.

On this the emperor determined to march againſt him in perſon; but was prevented by a rebellion which had been purpoſely excited in the country of Azab and that of the Dobas. The rebels were eaſily overthrown: but thus the expedition againſt the Naybe was delayed for a year; during which interval the emperor ſent for Michael to Gondar.

327 War with Michael governor o Tigré.

This order was poſitively refuſed, and a war enſued. Michael, unable to contend with the emperor in the open field, took to a high mountain, the uſual refuge of

Abyſſinian rebels. Here alſo his bad fortune purſued him; all his poſts were taken by ſtorm excepting one, which, it was evident, would likewiſe have been carried, though not without a very great expence of men. Here Michael requeſted a capitulation; and to enſure favourable terms, he deſired to put into the hands of Yaſous a great quantity of treaſure, which would otherwiſe be diſſipated among the common ſoldiers. This being done, Michael deſcended with a ſtone upon his head, as confeſſing himſelf guilty of a capital crime, with a deſign to make ſubmiſſion to the emperor. This was prevented for one day by a violent ſtorm of wind and rain; from which moment the Abyſſinians believe he began to converſe with the devil: but Mr Bruce informs us, that he has often heard him ſay it was Michael the archangel who was his correſpondent.

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Yaſous was firmly determined to put this rebel to death, notwithſtanding the quantity of gold he had received; nevertheleſs a promiſe was extorted from him that he would grant him his life. As ſoon as Michael came into his preſence, the emperor was filled with indignation, retracted his promiſe, and ordered him to be carried out and put to death before his tent-door. The execution of the ſentence, however, was prevented by the interceſſion of all the officers of any conſideration in the court or army. Such univerſal ſolicitation could not be withſtood: Michael was pardoned; but with theſe remarkable words, that the emperor waſhed his hands of all the innocent blood which Michael ſhould ſhed before he brought about the deſtruction of his country, which he knew he had been long meditating.

330
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iberty and
aiſed to
he higheſt
onours.

Michael continued for ſome time in priſon; but was afterwards ſet at liberty, and even reſtored to his government of Tigré. No ſooner was he reinſtated in this dignity, than collecting an army, he attacked Kaſmati Woldo governor of Amhara, defeated him in two battles, and forced him to take refuge among the Galla, whom he ſoon after bribed to murder him. In other reſpects he behaved as a moſt dutiful ſubject, gave the king the beſt intelligence, and ſupplied him with ſoldiers better accoutred than he had ever before beheld. He was alſo more humble than before his misfortune; nor did an increaſe of his favour and influence make him deviate from the line he had preſcribed. Having begun to gain friends by bribery, he continued to add one bribe to another to ſecure the old, and to gain new ones by the ſame means, pretending all the while to no kind of dignity or honour, not even to ſuch as was juſtly due to his own rank. Thus he became ſuch a favourite with the emperor, that he beſtowed upon him the governments of Enderta and Sire, in addition to that of Tigré; ſo that he was now maſter of almoſt one half of Abyſſinia. During the reign of Yaſous, however, he attempted nothing. The foundations of the diſturbances which ſucceeded were laid by the queen-mother, towards the end of the reign of Yaſous. This emperor had been married when very young to a lady of Amhara, by whom he had two ſons named Adigo and Aylo; but as his wife pretended to interfere in matters of ſtate, he was perſuaded by his mother to baniſh both her and her children to Wechne. After this his mother choſe a wife for him from among the Galla; a people of all others the moſt obnoxious to the Abyſſinians, both on account of the horrid barbarity of their manners, and the continual wars which from time immemorial had taken place between the two nations. The new queen was the daughter of one Amitzo, a prince who had once hoſpitably entertained Bacuſſa before he became emperor; and his people were eſteemed the leaſt barbarous of the whole. A prejudice againſt her, however, againſt her offspring, and the emperor himſelf, never to be effaced, now took place among the Abyſſinians; but this did not ſhow itſelf during the reign of Yaſous. The emperor died on the 21ſt of June 1753, being the 24th year of his reign, not without ſuſpicion of being poiſoned by his mother's relations, who were now attempting to engroſs the whole power of the empire into their hands.

331
auſe of the
reat civil
war in A-
yſſinia.

332
Death of
Yaſous.

333
Reign of
Ioas.

On the death of Yaſous, his ſon Ioas by the Galla princeſs juſt mentioned ſucceeded to the throne without any oppoſition. The diſcontent which had taken place in the former reign about the power aſſumed by the relations of the old queen, now began to ſhow itſelf more openly; and it was complained that a relationſhip to her was the only way to preferment, by which means the old families, whoſe merit had often ſaved the ſtate, were totally excluded from every ſhare of favour. On the acceſſion of the young king, a party of Galla horſe, ſaid to be about 1200 in number, were ſent as the portion of his mother; and theſe were quickly followed by a number of private perſons from motives of curioſity, or hopes of preferment, who were embodied to the number of 600 into a troop of infantry, the command of which was given to Wooſheka. The great favour in which theſe people were at court ſoon induced many others to make their appearance. Two of the king's uncles were ſent for by his expreſs deſire; and they brought along with them a troop of 1000 horſe. By the time they arrived the queen was dead; but her two brothers, named *Brulhe* and *Lubo*, finding that the king put an entire confidence in them, determined to make a party at court. This was eaſily effected; every thing was governed by Gallas; even the king himſelf affected to ſpeak their language; while the Abyſſinians were to the laſt degree mortified at ſeeing their inveterate enemies thus eſtabliſhing a dominion over them in the heart of their own country. At laſt the king thought proper to appoint his uncle Lubo to the government of Amhara; but this produced ſuch exceſſive diſcontent, that he was fain to retract his nomination, leſt a civil war ſhould have enſued. While the empire was thus divided into two parties, Suhul Michael came to Gondar in a very ſplendid manner, on an application from the exiled prince of Sennaar to be reſtored to his kingdom. When conducted into the preſence of the emperor, he proſtrated himſelf before him, owned himſelf his vaſſal, and was put in poſſeſſion of the government of Ras-el-Feel upon the frontiers, with a large revenue, where he was adviſed to ſtay till the diſputes which ſubſiſted at that time ſhould ſubſide. This ſalutary advice, however, he had not prudence to comply with; but ſuffering himſelf to be decoyed from his aſylum into Atbara, was taken priſoner and murdered.

334
The Galla
introduced
into Abyſ-
ſinia.

335
Two of
the king's
uncles ar-
rive, and
engroſs all
the power.

336
Suhul Mi-
chael ar-
rives at
court.

337
King of
Sennaar
murdered.

In the mean time, the Abyſſinian prime miniſter, Welled de l'Oul, died. He had hitherto moderated the fury of the oppoſite parties by his wiſe and prudent conduct; but no ſooner was he taken out of the way, than a moſt dreadful ſcene of confuſion and civil war took place, which raged with the utmoſt violence while Mr Bruce was in Abyſſinia, and ſeemed not likely to come to any termination when he left it.

338
State of the different parties.

The whole empire was divided into two great factions: at the head of the one was the old queen-mother of Yaſous; and at the head of the other, Ioas himſelf the emperor, with his Galla relations. Matters were firſt brought to a criſis by the imprudence of the emperor himſelf in beſtowing the government of Begemder upon Brulhe one of his Galla uncles. The government of this province had been lately reſigned into the hands of the queen by an old officer named *Ayo;* and it was ſuppoſed that his ſon named *Mariam Barea*, univerſally allowed to be one of the moſt accompliſhed noblemen of the kingdom, was to ſucceed him in this government. This opinion was farther confirmed by the marriage of Mariam himſelf with Ozoro Eſther, a daughter of the old queen by her ſecond huſband. Unfortunately a quarrel had happened between Kaſmati Ayo, the old governor of Begemder, and Suhul Michael, a little before the reſignation of the former, and continued undecided till Mariam took the office upon him. The occaſion was quite trifling; nevertheleſs, as Mariam had refuſed to ſubmit to the deciſion of the judges, whom he ſtigmatized as partial and unjuſt, inſiſting that the king ſhould either decide the affair in perſon, or that it ſhould be referred to the deciſion of the ſword, he thus fell under the imputation of being a diſobedient and rebellious ſubject.

339
Brulhe made governor of Begemder.

In conſequence of this, Ioas looked upon him ever afterwards with an evil eye; and now deprived him, by proclamation, of the government of Begemder, giving it to his own Galla uncle Brulhe, of whom we have already made ſo much mention.

340
An univerſal ferment enſues.

This unexpected promotion threw the whole empire into a ferment. As Begemder was a frontier province bordering on the country of the Galla, there was not the leaſt doubt, that, immediately on the acceſſion of Brulhe to his new office, it would be over-run by that race of barbarians, remarkable for their ſavage manners almoſt beyond all the other nations in Africa. This was the more dangerous as there was not above a day's journey betwixt the frontiers of Begemder and Gondar, the capital of the whole empire. Mariam Barea himſelf, who had a high ſenſe of honour, was particularly hurt at the manner in which he was deprived of his dignity, and condemned with his family to be ſubject to a race of Pagans, whom he had often defeated in battle, and obliged to acknowledge him as their ſuperior. All remonſtrance, however, was vain. Brulhe, under the ſanction of the imperial command, advanced with an army to take poſſeſſion of his new dignity: but ſo exceedingly averſe were the Abyſſinians to follow him in this expedition, that the army diſbanded itſelf ſeveral times after it had been collected; and it took up almoſt a year before he could proceed from the place where his camp was, at the lake Tzana or Dembea, to the frontiers of Begemder, though ſcarce half a day's journey diſtant.

341
Is oppoſed by Mariam Barea.

Mariam Barea beheld his operations with great contempt, employing his time in the diſpatch of ordinary buſineſs, and endeavouring to reconcile himſelf to the king, but without ſucceſs. As his laſt effort, he ſent a remonſtrance to the emperor; in which, after many proteſtations of duty and obedience, he reminded him, that, at his inveſtiture into the office of governor of Begemder, he had ſworn not to allow any of the Galla to enter his province: that, ſhould he deviate from the obſervance of this oath, the ſafety of the princes in Wackne would be endangered; they would conſtantly be liable to the invaſions of the Pagans, and probably be extirpated, as had already happened at two different times: and he begged of the emperor, if he was determined to deprive him of his government, to beſtow it rather upon ſome Abyſſinian nobleman; in which caſe he promiſed to retire, and live in private with his old father. He had, however, formed a reſolution, which he thought it his duty to ſubmit to the emperor, that if his majeſty ſhould think proper to come, at the head of a Galla army, to invade his province, he would retire to the fartheſt extremity of it, till he was ſtopped by the country of the Galla themſelves; and, ſo far from moleſting the royal army, he might be aſſured, that though his own men might be ſtraitened, every kind of proviſion ſhould be left for his majeſty. But if an army of Galla, commanded by one of that nation, ſhould enter the province, he would fight them at the well of Fernay, on the frontiers, before one of them ſhould drink there, or advance the length of a pike into the province.

This remonſtrance had no effect upon the emperor.

342
Farther promotio of Micha

He returned a ſcoffing anſwer, announcing the ſpeedy arrival of Brulhe, whom he thought ſure of victory: but, at the ſame time, to ſhow that he did not put his confidence entirely in his proweſs, he created Suhul Michael governor of Samen, which lay next to Tigré in the way to Samen, ſo that no obſtruction might lie in the way of that officer's march to Gondar, in caſe there ſhould be any occaſion for him. Mariam, provoked at the manner in which he was undervalued in the king's meſſage, gave an ironical reply, in which he alluded to the name of *Brulhe*, in the Abyſſinian language ſignifying a kind of *bottle;* this he told him would be broken on the rocks of Begemder, if ſent into that country.

343
Brulhe d feated an killed.

On receiving this laſt meſſage from Mariam, the king inſtantly ordered the army to be put in motion; but the Abyſſinians had unanimouſly determined not to act offenſively againſt their countrymen. Brulhe therefore was left to decide the affair with his Galla. Mariam kept exactly to his word in the declaration he had made to the king, not ſtirring out of his province, nor allowing the leaſt attempt to be made to haraſs his enemy, till they were drawn up at the well above mentioned, where he met them with his army. The Galla, unſupported by the Abyſſinian troops, were utterly unable to bear the ſhock of Mariam's army, and therefore ſoon betook themſelves to flight; but a part of them, who were ſurrounded by the cavalry, fought valiantly till they were all cut to pieces. Mariam had given the moſt expreſs orders to take Brulhe alive; or, if that could not be done, to allow him to make his eſcape. One of his ſervants, however, obſerving him in the field, puſhed up through the enemy to the place where he was, and running him twice through with a lance, left him dead on the ſpot.

Mariam Barea was no ſooner informed of the death of his rival, than he cried out in great emotion, that

Suhul Michael, with the whole army from Tigré, would attack him before autumn. In this he was not deceived. Ioas inſtantly diſpatched an expreſs for Michael, ordering his attendance, and inveſting him with the dignity of Ras, by which he became poſſeſſed of unlimited power both civil and military.

344
chael
atedRas.

Michael himſelf had for a long time ſeen that matters would come to this criſis at laſt, and had provided for it accordingly. He now ſet out with an army of 26,000 men, all of them the beſt ſoldiers in the empire, and 10,000 of them armed with muſkets.

345
mmits
eat de-
ſtations.

As he paſſed along, his troops deſolated the country wherever they came, but he encumbered his army by nothing uſeleſs; allowing his men to carry along with them neither women, tents, beaſts of burden, nor even proviſions. The ſubſiſtence of his troops was abundantly provided for by the miſerable inhabitants of the provinces thro' which he paſſed; and, not ſatisfied with this, he inſiſted on a contribution in money from all the diſtricts within a day's march of thoſe places where he was; the leaſt delay was followed by the ſlaughter of the inhabitants and deſtruction of their houſes. Towns, villages, and buildings of every kind, were ſet on fire as he paſſed along; the people fled from all quarters to the capital for refuge, as from the face of the moſt inveterate enemy; and Ioas himſelf was now ſenſible of his having been in the wrong to inveſt him with ſuch unlimited power.

346
rives at
ondar.

On his arrival at the capital, Michael took poſſeſſion of all the avenues, as if he meant to beſiege it; ſo that an univerſal conſternation enſued. Inſtead of offering any hoſtility, however, he waited with the utmoſt reſpect on the emperor, proceeding immediately from the royal preſence to his own houſe, where he ſat in judgment, as the nature of his office required him to do.

347
xecutes
ſtice im-
partially.

No ſooner had he taken upon him this new office, however, than he executed juſtice in ſuch a rigorous and impartial manner as made the boldeſt offenders tremble. Some parties of his own ſoldiers, preſuming upon the licence that had hitherto been granted them, entered Gondar and began to plunder as they had done in other places; but, on the very firſt complaint, their commander cauſed 12 of them to be apprehended and hanged. Their execution was followed by 50 others in different quarters of the city; after which he gave the charge of the capital to three officers who were to preſide over three quarters, himſelf taking care of the fourth. Two civil judges were appointed to aſſiſt each officer in a diſtrict, two were left in the king's houſe, and four of them held a court of judicature in his own. Thus the inhabitants, finding, that inſtead of bloodſhed and maſſacre, they were to expect nothing but ſtrict equity and moderation, became reconciled to Michael the day after his arrival, and lamented only that he had not come ſooner to relieve them from the anarchy and confuſion in which they had been held ſo long. To ſo great a degree of perfection indeed did he bring his legiſlation, that a very ſhort time after he entered the city, a loaf of bread, a bottle of water, and an ounce of gold, were expoſed in the market-place on the head of a drum night and day for ſome time, without any one offering to take them away. This was the more remarkable as there was then a ſcarcity of proviſions, and Michael himſelf would allow but a very ſcanty ſupply of water to be carried into the city; thereby giving the inhabitants to underſtand, that if he ſhould ſet fire to it as he had done to other places, it would not be in their power to quench the flames.

348
Marches
againſt Mariam Barea.

The capital being thus ſecured in perfect obedience, Michael next prepared to ſet out on his expedition againſt Mariam Barea. Senſible, however, that the deſtruction of this worthy nobleman would be attended with a great degree of odium, he was reſolved that none of it, or at leaſt as little as poſſible, ſhould fall upon himſelf. For this purpoſe, he inſiſted that the emperor ſhould march in perſon from Gondar, and carry all his ſoldiers along with him. Thus he had an opportunity of throwing the whole blame upon Ioas, and repreſenting himſelf as no more than a paſſive inſtrument in the affair. He alſo took every occaſion of praiſing his antagoniſt for his virtues, and cenſuring the emperor for attempting to cut off ſuch an excellent officer.

In the mean time Mariam Barea keeping exactly to the terms of the laſt remonſtrance he had ſent to Ioas, retired before him to the extremity of the province. Ioas and Michael advanced furiouſly, burning and deſtroying every thing as they went along. An engagement at laſt took place at a place called *Nefas Muſa*, on the extreme borders of Begemder, when Mariam could not retreat without going out of the province. As the royal army was more than twice the number of the other, and commanded by an officer of ſuperior ſkill, victory was not long of being decided in its favour.

349
Mariam defeated.

Mariam, with 12 of his officers, took refuge in the country of the Galla; but were immediately delivered up by that faithleſs people.

350
Betrayed
by the Galla, and
cruelly
murdered.

He was put to death by Lubo the brother of Brulhe, who is ſaid with his own hands to have cut his throat as a ſheep is commonly killed in this country, and afterwards to have disfigured the body in a ſhocking manner. The head was cut off, and carried to Michael's tent, who would not allow it to be uncovered in his preſence. It was afterwards ſent to the family of Brulhe in the country of the Galla, to ſhow them what attention had been given to revenge his death; and this diſpleaſed the Abyſſinians even more than any thing that had yet happened ſince the beginning of the conteſt.

351
Some of his
officers protected by
Michael.

The 12 officers, who were taken along with him, ſought protection in the tent of Ras Michael, to which they were ſuffered to eſcape by Wooſheka their keeper. Lubo, however, intended likewiſe to have ſacrificed them as he had done Mariam, and therefore ſent Wooſheka to demand them: but no ſooner had he unfolded his errand, than Michael in a rage, called to his attendants to cut him in pieces before the tent-door; which would certainly have been done, had he not fled with the utmoſt precipitation.

352
Diſagreement between the
king and
Michael.

The ſcandalous aſcendency which the Galla always manifeſted over the king, had greatly diſpleaſed Michael; who expreſſed himſelf ſo freely on the ſubject, that a coolneſs took place between them. Another officer named *Waragna Faſil*, a Galla by birth, had inſinuated himſelf into the king's favour, and greatly diſtinguiſhed himſelf at the battle of Nefas Muſa. It was no wonder, therefore, that he ſoon became a rival to Michael; and this rivalſhip was greatly augmented by the following circumſtance. Near the field of battle at Nefas Muſa was a houſe of Mariam Barea, where Ozoro Eſther his widow now was. Being ſurrounded by pleaſant and verdant meadows, Faſil encamped there for the ſake of his cavalry. No other deſign was at that time apparent; however, his preſence greatly alarmed the princeſs. She had along with her at that time a nobleman named *Ayto Aylo*, who had been at the battle of Sennaar; but had there been terrified to ſuch a degree, that he reſolved to renounce the world ever after and turn monk. In this character he was now with Ozoro Eſther; and though he refuſed to be concerned in any military affairs, he was ſtill conſulted by both parties as a kind of oracle. In the preſent emergency, therefore, he told the princeſs that there was only one way by which ſhe could ſecure herſelf from the cruelty of the Galla, and becoming a prey to one or other of the murderers of her huſband; and that was by immediately eſpouſing Ras Michael. Ozoro was perfectly ſenſible of the propriety of the advice, and therefore ſet out next morning in company with Aylo to Michael's tent. Here ſhe threw herſelf at his feet on the ground; and refuſing to riſe, Aylo explained her errand, informing the Ras that ſhe intended to beſtow herſelf upon him in marriage, as being the only perſon not guilty of her former huſband's death capable of affording her protection in her preſent ſituation.

353
Michael marries the princeſs Ozoro Eſther.

Michael ſaw clearly the advantages attending ſuch a match; and therefore having cauſed the army to be drawn up in order of battle, as if for a review, he ſent for a prieſt, and was married to the princeſs in the ſight of all his men. The ceremony was followed by the loud acclamations of the whole army; and Ioas was ſoon informed of the reaſon. He expreſſed his diſpleaſure at the match, however, in ſuch unequivocal terms, that a mutual hatred commenced from that moment. This was ſoon made public by a very trifling accident. One day while the army was marching, Michael being much incommoded by the ſun which affected his eyes, threw a white handkerchief over his head to keep off the heat. This was inſtantly told the king, who took it as an affront offered to himſelf; for in Abyſſinia it is unlawful to cover the head on any occaſion whatever in preſence of the emperor, or even within ſight of the palace where he lodges. Ioas was no ſooner informed of the ſuppoſed affront, than he ſent to the Ras to know upon what account he preſumed to cover his head in his preſence; but though the covering was inſtantly taken off, it was thought that no atonement could ever be made for ſuch a grievous offence. Soon after this a quarrel happening between Faſil and a perſon named *Guſho*, likewiſe a man of great conſequence, complaint was made to the Ras, who, as civil judge, ſummoned both parties before him. Faſil abſolutely refuſed to obey any ſuch juriſdiction; and the affair being laid before the other judges, it was given in favour of Michael, and Faſil declared to be in rebellion.

354
Final quarrel betwixt Michael and Faſil

This was followed by a proclamation depriving him of his government of Damot, and every other public office he held. Faſil, however, had no mind to ſubmit to this diſgrace; and therefore, after holding a long conference with the king, departed with his army, encamping on the high road betwixt Damot and Gondar, where he intercepted the proviſions coming from the ſouthward to the capital.

355
A ſhot fired at Michael from the palace window.

This was followed by an attempt to aſſaſſinate the Ras. A ſhot was fired from one of the windows of the palace into the houſe where he ſat in judgment; the diſtance being ſo ſmall, that he could eaſily be ſeen from the palace while thus employed. The ball, however, miſſed Michael, but killed a dwarf who was ſtanding before him fanning the flies from his face. As it was evident that this ſhot muſt have been fired with the knowledge of the king, it was rightly judged to be the commencement of hoſtilities. Ioas inſtantly removed to a diſtance, but ſent Wooſheka with orders to the Ras to return to Tigré without ſeeing his face; declaring, at the ſame time, his own uncle Lubo governor of Begemder and Amhara. Michael could ſcarcely be prevailed upon to ſee Wooſheka, and told him that he ſhould certainly be put to death the next time he appeared in his preſence. Next day Ioas ſent a meſſage to the Ras by four judges, commanding him to return to Tigré without the leaſt delay, under pain of his higheſt diſpleaſure. Michael returned a formal anſwer, concluding, that he expected the king himſelf to be ready to march againſt Faſil to morrow. To this an abſolute refuſal was given; on which Michael iſſued a proclamation, commanding all the Galla to leave the capital next day under pain of death: in caſe of diſobedience they were declared outlaws, and liable to be killed by the firſt that met them if they were found 24 hours after the proclamation in the capital, or to the ſame penalty if they were found in the kingdom after ten days.

356
Faſil defea ed by Michael.

An engagement took place a ſhort time after, in which Faſil was totally defeated, and obliged to retire into Damot. In this engagement ſome of the king's black horſe were taken. Theſe are all ſlaves, and ſubject to no other commands but thoſe of his majeſty himſelf. The appearance of them therefore ſhowed that they muſt have been ſent by the king to fight againſt the Ras. All of them were therefore brought before the latter, and interrogated by whoſe orders they had come to the battle. Two refuſed to give any anſwer, and had their throats cut in preſence of their companions. A third plainly told him that they had been ſent by the king; who had likewiſe ordered an Armenian to fire out of the palace window at Ras Michael.

357
Ioas aſſaſſinated.

On this the priſoners were diſmiſſed; but aſſaſſins inſtantly diſpatched to put an end to the king's life; which they accompliſhed, and buried him in a church dedicated to St Raphael.

358.
Hannes ſe up by Michael, and ſoon after poiſoned.

On the death of Ioas, Michael, now abſolute maſter of Abyſſinia, ſet up for emperor Hannes, brother to the late king Bacuffa, an old man who had reſided almoſt all his lifetime on the mountain of Wechne, and being entirely unacquainted with the affairs of the world was on this account probably ſuppoſed by Michael to be the more proper for his purpoſes. Hannes had been maimed by the loſs of his hand, on purpoſe to incapacitate him for the throne; but this objection was laughed at by the Ras. He found him, however, poſſeſſed of a quality much more inimical to his own purpoſes; and that was, an abſolute averſion at meddling with the affairs of government: ſo that he could not by any means be induced to take the field againſt Faſil. Michael therefore was obliged to ſet out by himſelf; but thinking it improper to leave a king of any kind behind him in the capital, he had the old man poiſoned before his departure; putting his ſon Tecla Haimanout in his place.

The young emperor, according to Mr Bruce's account, 359 g of cla Hai- nout.

360 il defeat

count, was of a fair complexion, leſs tawny than a Neapolitan or Portugueſe, owing to his having been born in the mountain. He was endowed with many princely accompliſhments; and ſo much attached to Michael Ras, that he called him *Father* from the time of his acceſſion, waiting upon him when indiſpoſed with the affection of a ſon. There being now no objection therefore, Michael marched againſt Faſil without delay, and entirely defeated him on the 3d of December 1769. On this occaſion Wooſheka was taken priſoner, and afterwards flead alive, notwithſtanding the interceſſion of ſome of Michael's officers for him; his ſkin being afterwards formed into a bottle. This piece of cruelty was attributed to Ozoro Eſther; whom Mr Bruce repreſents as the moſt humane and merciful of women; though he is obliged to allow, that on the preſent occaſion, as well as on every other which regarded her former huſband, ſhe entirely forgot her character. The night on which this miſerable victim was deſtroyed, ſhe appeared in the king's tent dreſſed like a bride; and in a little time returned in triumph to Gondar.

361 Ir Bruce's rival and dventures a byſ- nia.

Soon after theſe tranſactions, Mr Bruce entered Abyſſinia. He arrived at Maſuah when there was only a report of Hannes's being ill, and Mr Bruce was ſuppoſed to be his phyſician, though in truth that emperor was already dead. Here he was ill-treated by the naybe, with a deſign to extort money, and afterwards probably to put him to death, as was his cuſtom with other ſtrangers. He eſcaped the danger, however, by the protection of Achmet, nephew and heir apparent to the naybe; and by his own prudent and reſolute behaviour, threatening his adverſaries with the arrival of a Britiſh man of war in caſe of any injury; ſhowing the Grand Signior's protection; making uſe of the name of Ras Michael, now ſo formidable, and to whom he had obtained a recommendation, &c. After many vexations and delays, he was at laſt allowed to depart; and a guide, by name *Saloome*, was ſent along with him. This man was brother-in-law to the naybe, and a profeſſed Chriſtian; but a traitor in his heart, and who wiſhed to do every thing in his power to hurt our traveller. He was furniſhed with another guide, however, by his friend Achmet, to inform him where to pitch his tent, and other neceſſary particulars.

362 Sets out from Arkeeko.

363 Account of the country through which he paſſed.

364 Sudden ſwell of a torrent.

On the 15th of November 1769 Mr Bruce left Arkeeko on the eaſtern coaſt of Africa, and proceeded ſouthward for Gondar the capital of Abyſſinia. After an hour's journey, he pitched his tent near a pit full of rain-water, where he remained all day; and in the evening a meſſenger arrived from the naybe, who took away the guide *Saloomé*. Next day the latter returned in company with Achmet the naybe's nephew, already mentioned. The latter cauſed him depoſit in his hands Saloome's full hire, as though he had gone the whole length he had promiſed. Four of the men were commanded to go back to Arkeeko, and others put in their place: after which Achmet told Mr Bruce, that he was not to take the road through Dobarwa, though near, becauſe it belonged to the naybe; but that Saloome knew another by a place called *Dixan*, which belonged to himſelf, and where he could enſure him of a good reception. In this journey he told him, that he would be obliged to croſs the mountain of Taranta, the higheſt in Abyſſinia; but the fatigue of this would be more than recompenſed by the aſſurance of ſafety and the curioſity of the place. Taking leave of Achmet in a very friendly manner, therefore, Mr Bruce with his company finally ſet out on their journey the evening of the 16th. For the ſhort ſpace they had travelled, the ground was covered with graſs broader in the leaf than ours; but in a little time the ſoil became hard, dry, gravelly, and full of acacia or Egyptian thorn. Next day (17th) they changed their courſe from ſouth to weſt; and ſoon arrived at a range of mountains ſtanding ſo cloſe to one another, that there was no paſſage between them excepting what was worn by torrents of water; the bed of one of which conſequently now became their road. In the evening they pitched their tent at ſome diſtance from this torrent, which had ſcarcely any water in it when they left it; but all the afternoon there had been an appearance of rain, with much thunder and lightning, at a diſtance. On a ſudden they heard a noiſe among the mountains louder than thunder; and inſtantly ſaw the torrent, ſwelled immenſely by the diſtant rains, now running like a rapid river, and the foremoſt part of it advancing in its bed in a body of water about the height of a man. Having run for ſome time in this violent manner, the current, no longer ſupplied by the rains, began to diminiſh, and by the next morning was quite gone. Among theſe mountains the nights are cold even in ſummer.

365 Notes of the African birds different from thoſe of Europe.

On the 18th the journey was reſumed in the bed of the torrent, which now ſcarcely had any water; though the ſtones were rendered very ſlippery by the quantity of rain which had fallen. Leaving this diſagreeable road, they came to a fine rivulet; which being the firſt clear water they had ſeen from the time Mr Bruce left Syria, was exceedingly agreeable. They proceeded along the banks of this river for ſome time; and ſoon after leaving it, they came to another of the ſame kind: but next day were obliged to reſume their courſe in the bed of a torrent. The mountains in this part of the world are exceſſively rugged and full of precipices, entirely deſtitute of ſoil, and covered with looſe ſtones of a black colour. On the ſide of the torrent in which they marched, however, there grew very large ſycamore trees, ſome of them little leſs than 7½ feet in diameter. Their branches afforded ſhelter to an infinite number of birds; many of them without ſong; but others having notes very different from the European kinds, and peculiar to the continent of Africa. Moſt of thoſe which had very beautiful colours were of the jay or magpie kind. The trees were loaded with figs; but they come to nothing, by reaſon of the ignorance of the ſavages, who know not the proceſs of caprification. The ſtreams of water themſelves, which at this ſeaſon were found ſo delightful, run only after October: they appear on the eaſt ſide of the mountains when the ſummer rains in Abyſſinia are ceaſing; at other times, no water is to be met with, excepting what is contained in ſtagnant pools.

366 Account of the mountain Taranta.

On the 20th of November they began to aſcend the high mountain of Taranta. Their road was now exceſſively rugged and uneven, interſected with monſtrous gullies and holes made by the torrents, as well as by huge fragments of rocks tumbled down by the torrents. It was with the utmoſt difficulty that they could

could carry the aſtronomical inſtruments up this hill; in which work Mr Bruce himſelf, and one of his attendants named *Yaſine*, a Moor, bore a principal ſhare. The only misfortune they met with was, that their aſſes being unloaded, and committed to the care of a ſingle perſon, refuſed to aſcend this barren mountain; and in ſpite of all that their driver could do, ſet off at a briſk trot for the fertile plains below. Luckily, however, they were afterwards recovered by four Moors ſent after them, and the journey reſumed without any material interruption. The beaſts were now become much more tractable, having been ſeen and purſued by the hyænas with which that mountain abounds.

367 Of the village Halai, and inhabitants of the mountains.

368 Beautiful cattle, &c.

Taranta is ſo deſtitute of earth, that there was no poſſibility of pitching a tent upon it; ſo that our travellers were obliged to take up their lodging in one of the caves with which it abounds. The under part of the mountain produces in great plenty the tree called *Kolquall*, which was here obſerved in greater perfection than in any other place throughout the whole journey. The middle part produced olives which carried no fruit; and the upper part was covered with the oxycedras or Virginia cedar, called *arze* in the language of the country. On the top is a ſmall village named *Halai*, inhabited by poor ſhepherds, who keep the flocks of the rich people of the town of Dixan below. They are of a dark complexion, inclining to yellow; their hair black, and curled artificially by means of a ſtick, and which our author ſuppoſes to be the ſame with the *criſping-pin* mentioned Iſa. iii. 22. The men have a girdle of coarſe cotton-cloth, ſwathed ſix times round their middle; and they carry along with them two lances, and a ſhield made of bulls hides. Beſides theſe weapons, they have in their girdles a crooked knife with a blade about 16 inches in length, and three in breadth at the lower part. There is here great plenty of cattle of all kinds; the cows generally of a milk white, with dew-laps hanging down to their knees; their horns wide like thoſe of the Lincolnſhire cattle; and their hair like ſilk. The ſheep are all black both here and throughout the province of Tigré; having hair upon them inſtead of wool, like the reſt of the ſheep within the tropics; but remarkable for its luſtre and ſoftneſs, without any briſtly quality. On the top of the mountain is a plain, which, at the time our author was there, they had ſown with wheat. The air ſeemed exceſſively cold, though the barometer was not below 59° in the evening. On the weſt ſide the cedars, which on other parts are very beautiful, degenerate into ſmall ſhrubs and buſhes.

369 Town of Dixan deſcribed.

The road down this mountain was for ſome time nothing inferior in ruggedneſs to what they had met with in aſcending it; but as they approached Dixan, it became conſiderably better. This is the firſt town on the Abyſſinian ſide of Taranta. It is ſeated on the top of an hill of a form exactly conical, ſurrounded by a deep valley like a ditch; and no acceſs to it but by a path which winds round the hill. The inhabitants were formerly exterminated by Michael Ras; and the ſucceeding race, in Mr Bruce's time, were of a very indifferent character, being, as he ſays, compoſed of the worſt people from the territories of the Baharnagaſh and the province of Tigré, on both of which it borders. Here he was in danger from the treachery of Saloome, who wiſhed to have decoyed him into the power of ſome aſſaſſins. Finding that this could not be done, he ſurrounded Mr Bruce and his retinue with a body of armed men; but they were diſperſed by the authority of Hagi Abdelcader, the friend of Achmet, who had received orders to provide for the ſafety of the travellers. The only trade carried on here is that of buying and ſelling ſlaves; who are ſtolen from Abyſſinia, chiefly by the prieſts, and ſent into Arabia and India.

370 Journey t Adowa, th capital of Tigré.

371 His treacherous guide obliged to return.

The next ſtage was from Dixan to Adowa, capital of the province of Tigré. Leaving Dixan on the 25th of November, they pitched their tent the firſt night under a large ſpreading tree called *Daroo*, which Mr Bruce ſays was one of the fineſt he ſaw in Abyſſinia, being about 7½ feet in diameter. They had been joined by ſome Moors driving 20 loaded aſſes and two bulls, which in that country are likewiſe uſed as beaſts of burden. Here, our author ſays, he recovered a tranquillity of mind which he had not enjoyed ſince his arrival at Maſuah; but they were now entirely without the dominions of the naybe, and entered into thoſe of the emperor. Saloome attended them for ſome way, and ſeemed diſpoſed to proceed; but one of the company, who belonged to the Abyſſinian monarch, having made a mark in the ground with his knife, told him, that if he proceeded one ſtep beyond that, he would bind him hand and foot, and leave him to be devoured by wild beaſts.

372 The country becomes mo fertile as l paſſes along.

Being now in a great meaſure delivered from their fears and embarraſſments, the company proceeded on their journey with pleaſure, through a much better country than they had hitherto paſſed. In ſome places it was covered with wild oats, wood, high bent-graſs, &c. but, in not a few places, rocky and uneven. Great flocks of a bird as large as a turkey, called, in the Amharic language, *Erkoom*, were ſeen in ſome places. A large animal of the goat kind, called *Agazan*, was found dead and newly killed by a lion. It was about the ſize of a large aſs, and afforded a plentiful repaſt. Numbers of kolquall trees were alſo ſeen; and the ſides of the river Habeſh were adorned with a beautiful tree of the ſame name with the ſtream. There were in this place alſo many flowers of various kinds, particularly jeſſamine. The mountains of Adowa, which they came in ſight of on the 5th of December, are totally unlike any thing to be met with in Europe; their ſides being all perpendicular rocks, like ſteeples or obeliſks of many different forms.

373 Adowa d ſcribed.

Adowa, though the capital of an extenſive province or kingdom, does not contain above 300 houſes; but occupies nevertheleſs a large ſpace, by reaſon of the incloſures of a tree called *Wanzey*, which ſurrounds each of the houſes. It ſtands on the declivity of a hill, ſituated on the weſt ſide of a ſmall plain ſurrounded by mountains. It is watered by three rivulets which never become dry even in the greateſt heats. A manufacture is carried on here of a kind of coarſe cotton cloth, which paſſes for money throughout all Abyſſinia. The houſes are built of rough ſtone cemented with mud; lime being only uſed in the conſtruction of thoſe at Gondar, and even there it is very bad.

Our traveller was very hoſpitably entertained at A-

374 ſits the ns of um.

dowa by one Janni, with whom he reſided during his ſtay there. Leaving it on the 17th of December, he viſited the ruins of Axum, once the capital of the empire. Here are 40 obeliſks, but without any hieroglyphics. A large one ſtill remains, but the two largeſt are fallen. There is alſo a curious obeliſk, of which he gives a figure, with other antiquities which our limits will not allow us to enlarge upon. The town has at preſent about 600 houſes, and carries on manufactures of the coarſe cotton-cloth already mentioned. It is watered by a ſmall ſtream which flows all the year, and is received into a fine baſon 150 feet ſquare, where it is collected for the uſe of the neighbouring gardens. Its latitude was found by Mr Bruce to be 14° 6′ 36″ north.

375 rous arbarity of f the A-yſſinians.

On the 20th of January 1770, our traveller ſet out from Axum. The road was at firſt ſmooth and pleaſant, but afterwards very difficult; being compoſed of ſtones raiſed one above another, the remains of a magnificent cauſeway, as he conjectures. As they paſſed farther on, however, the air was every where perfumed by a vaſt number of flowers of different kinds, particularly jeſſamine. One ſpecies of this, named *Agam*, was found in ſuch plenty, that almoſt all the adjacent hills were covered by it; the whole country had the moſt beautiful appearance; the weather was exquiſitely fine, and the temperature of the air agreeable. In this fine country, however, Mr Bruce had the firſt opportunity of beholding the horrible barbarity of the Abyſſinians in cutting off pieces of fleſh from the bodies of living animals, and devouring them raw; but notwithſtanding this extreme cruelty, they have the utmoſt horror and religious averſion at pork of every kind; inſomuch that Mr Bruce durſt not venture to taſte the fleſh of a wild boar, juſt after having aſſiſted in the deſtruction of five or ſix.

During the remaining part of the journey from Adowa to Sirè, the country continued equally beautiful, and the variety of flowers and trees greatly augmented; but as a report was propagated that Ras Michael had been defeated by Faſil, they now met with ſome inſults. Theſe, however, were but trifling; and on the 22d in the evening they arrived ſafely at Sirè, ſituated in N. Lat. 14° 4′ 35″.

376 irè deſcribed.

This town is ſtill larger than Axum: but the houſes are built of no better materials than clay, and covered with thatch; the roofs being in the form of cones, which indeed is the ſhape of all thoſe in Abyſſinia. It ſtands on the brink of a very ſteep and narrow valley, through which the road is almoſt impaſſable. It is famous for a manufacture of cotton-cloth, which, as we have already obſerved, paſſes for money throughout the whole empire. At ſome times, however, beads, needles, antimony, and incenſe, will paſs in the ſame way. The country in the neighbourhood is extremely fine; but the inhabitants ſubject, by reaſon of the low ſituation, to putrid fevers. On leaving it on the 24th, our travellers paſſed through a vaſt plain, where they could diſcern no hills as far as the eye could reach, excepting ſome few detached ones ſtanding on the plain, covered with high graſs, which the inhabitants were then burning. The country to the northward is flat and open. In the way to Gondar, however, lie that ridge of mountains called *Samen*; of which one named *Lamalmon* is the moſt remarkable, and by ſome ſuppoſed to be the higheſt in Abyſſinia. Betwixt Sirè and theſe mountains the river Tacazze runs, which, next to the Nile, is the largeſt in Abyſſinia. Mr Bruce informs us that it carries near one third of the water which falls on the whole empire; and when paſſing it, he ſaw the marks of its ſtream, the preceding year, 18 feet perpendicular above the bottom; nor could it be aſcertained whether this was the higheſt point to which it had reached. It has its ſource in the diſtrict of Angot, riſing from three ſources like the Nile, in a flat country, about 200 miles to the S. E. of Gondar. It is extremely pleaſant; being ſhaded with fine lofty trees, the water extremely clear, and the banks adorned with the moſt fragrant flowers. At the ford where they croſſed, this river was fully 200 yards broad, and about three feet deep; running very ſwiftly over a bottom of pebbles. At the very edge of the water the banks were covered with tamariſks, behind which grew tall and ſtately trees, that never loſe their leaves. It abounds with fiſh, and is inhabited by crocodiles and hippopotami; the former of which frequently carry off people who attempt to croſs the river upon blown up ſkins. The neighbouring woods are full of lions and hyænas. The Tacazze is marked by Mr Bruce in his map as a branch of the Aſtaboras, which falls into the Nile. The latitude of the ford was found to be 13° 42′ 45″.

377 Tacazze river deſcribed.

378 Mountainous country of Samen deſcribed.

This river was paſſed on the 26th of January; after which our travellers entered into the country of Samen; the governor of which, Ayto Teſfos, had never acknowledged the authority of Ras Michael, nor any of the emperors ſet up by him ſince the death of Joas. The country therefore was hoſtile; but the uncertainty of the event of the war, and the well-known ſeverity of Michael's diſpoſition, preſerved our traveller and his company from any inſult, excepting a feeble and unſucceſsful attempt to extort money. Here Mr Bruce obſerves that the people were more flat-noſed than any he had hitherto ſeen in Abyſſinia. The path among the mountains was for the moſt part exceedingly dangerous, having a precipice of vaſt height cloſe by it which way ſoever you turn. The mountains appeared of very extraordinary ſhapes; ſome being like cones; others high and pointed like columns, pyramids, or obeliſks. In one place a village was obſerved in ſuch a dangerous ſituation, that ſcarce the diſtance of a yard intervened between the houſes and a dreadful precipice. Below it is a plain of about a mile ſquare, covered with citron and lemon trees. A river named *Mai-Lumi* riſes above this village, and falls into the wood, where it divides in two; one branch ſurrounding the north and the other the ſouth part of the plains; then falling down a rock on each ſide, they unite; and having run about a quarter of a mile farther, the ſtream is precipitated in a cataract 150 feet high. The lions and hyænas were very numerous among theſe mountains, and devoured one of the beſt mules our travellers had. The hyænas were ſo bold, that they ſtalked about as familiarly as dogs, and were not intimidated by the diſcharge of fire-arms. Their voracity was ſuch, that they eat the bodies of thoſe of their own ſpecies which our travellers had killed in their own defence.

379 Extreme voracity of the hyænas.

380 Lamalmon mountain deſcribed.

On the 7th of February they began to aſcend Lamalmon by a winding path ſcarcely two feet broad, on the brink of a dreadful precipice, and frequently interſected by the beds of torrents, which produced vaſt irregular chaſms in it. After an aſcent of two hours, attended with incredible toil, up this narrow path, they came to a ſmall plain named *Kedus* or *St Michael*. from a church of that name ſituated there. This plain is ſituated at the foot of a ſteep cliff, terminating the weſtern ſide of the mountain, which is as perpendicular as a wall, with a few trees on the top. Two ſtreams of water fall down this cliff into a wood at the bottom; and as they continue all the year round, the plain is thus preſerved in continual verdure. The air is extremely wholeſome and pleaſant. On aſcending to the very top of the mountain, where they arrived on the 9th of February, our travellers were ſurpriſed to find, that though from below it had the appearance of being ſharp-pointed, it was in reality a large plain, full of ſprings, which are the ſources of moſt rivers in this part of Abyſſinia. Theſe ſprings boil out of the earth, ſending forth ſuch quantities of water as are ſufficient to turn a mill. A perpetual verdure prevails; and it is entirely owing to indolence in the huſbandman if he has not three harveſts annually. The Lamalmon ſtands on the north-weſt part of the mountains of Samen; but though higher than the mountains of Tigré, our author is of opinion that it is conſiderably inferior to thoſe which are ſituated on the ſouth-eaſt. The plain on the top is altogether impregnable to an army, both by reaſon of its ſituation and the plenty of proviſions it affords for the maintenance of its inhabitants; even the ſtreams on the top are full of fiſh. Here the mercury in the barometer ſtood at 20$\frac{7}{8}$ inches.

381
Journey to Gondar.

During the time our travellers remained at Lamalmon, a ſervant of Ras Michael arrived to conduct them ſafely to the capital, bringing a certain account of the victory over Faſil; ſo that now the difficulties and dangers of their journey were over. The country appeared better cultivated as they approached the capital; and they ſaw ſeveral plantations of ſugar-canes, which there grow from the ſeed. In ſome places, however, particularly in Woggora, great damage is done by ſwarms of ants, rats, and mice, which deſtroy the fruits of the earth. Mr Bruce had already experienced the miſchief ariſing from a ſmall ſpecies of ant, whoſe bite was not only more painful than the ſting of a ſcorpion, but iſſued out of the ground in ſuch numbers as to cut in pieces the carpets and every thing made of ſoft materials to which they could have acceſs.

382
Miſchief done by ants.

383
Arrival at Gondar.

When Mr Bruce approached the capital, he was dreſſed like a Moor: and this dreſs he was adviſed to keep until he ſhould receive ſome protection from government; his greateſt, indeed his only, danger ariſing from the prieſts, who were alarmed at hearing of the approach of a Frank to the capital. This was the more neceſſary, as the emperor and Michael Ras were both out of town. For this reaſon alſo he took up his reſidence in the Mooriſh town at Gondar; which is very large, containing not fewer than 3000 houſes. The only inconvenience he underwent here was the not being allowed to eat any fleſh: for we have already taken notice of a law made by one of the emperors, that none of his ſubjects ſhould eat fleſh but ſuch as had been killed by Chriſtians; and a deviation from this would have been accounted equal to a renunciation of Chriſtianity itſelf. Here he remained till the 15th of February; when Ayto Aylo waited upon him, and addreſſed him in the character of phyſician, which he had aſſumed. By this nobleman he was carried to the palace of Koſcam, and introduced to the old queen. His advice was required for one of the royal family who was ill of the ſmall-pox; but a ſaint had already undertaken his cure. The event, however, proved unfortunate; the patient died, and the ſaint loſt his reputation. Our limits will not allow us to give any particular account of the ſteps by which Mr Bruce arrived at the high degree of reputation which he enjoyed in Abyſſinia. In general his ſucceſs in the practice of medicine, his ſkill in horſemanſhip, and the uſe of firearms, which by his own account muſt be very extraordinary; his prudence in evading religious diſputes; as well as his perſonal intrepidity and preſence of mind, which never once failed him, even in the greateſt emergencies; all conſpired to render him agreeable to people of every denomination. By the king he was promoted to the government of Ras-el-Feel, was his conſtant attendant on all occaſions, and was with him in ſeveral military expeditions; but never met with any opportunity of diſtinguiſhing his perſonal valour, though he had the command of a body of horſe at one of the battles fought at a place named *Serbruxos*. Thus honoured and employed, he had an ample opportunity of exploring the ſources and cataracts of the Nile, as well as the geography and natural products of the whole country; obtaining alſo leave at laſt to return home. We cannot, however, praiſe the benevolence of his ſpirit at his departure. It has already been obſerved, that he was in ſome danger from the prieſts on his firſt arrival, on account of their ſuſpecting him to be a Jeſuit; for that is the meaning which they affix to the word *Frank* or *European*. As he conſtantly attended the eſtabliſhed worſhip of the country, however, and carefully avoided all diſputes on the ſubject of religion, he became at laſt not only unſuſpected, but very intimate with many of the principal eccleſiaſtics. From one of theſe, named *Tenſa Chriſtos*, he aſked a benediction immediately before he departed; which piece of unexpected humility ſo affected the prieſt, that it brought tears in his eyes. The benediction was conveyed in the ſimple form, "God bleſs you." A troop of inferior prieſts who attended would needs bleſs him alſo; and probably were pleaſed at having it in their power to beſtow a benediction publicly on a man of ſuch conſequence: but to the bleſſings of theſe poor monks Mr Bruce replied *in Engliſh*, "Lord ſend you all a halter, as he did Abba Salama!" This Abba Salama had been an eccleſiaſtic of great conſequence; but of a very diſſolute life, and at laſt hanged for his crimes. The monks imagined he had been recommending them to their patriarch Abba Salama, and with great devotion anſwered "Amen."

384
Mr Bruce introduced to the queen.

385
Is promoted and held in great eſtimation.

386
His departure from the country.

387
Event of the war b fore he le the country.

The hiſtory of the war after Mr Bruce's arrival is related at great length in his work. The king Tecla Haimanout ſtill kept his ground, and was at laſt acknowledged by almoſt the whole empire, though ſucceſs did not always attend his arms. An uſurper, named *Socinios*, was reduced and made a ſervant in the king's kitchen; but was afterwards hanged for theft. Ras Michael, notwithſtanding all his ſkill in military affairs, was not able to get the better of Faſil; and his exceſſive cruelty, avarice, and ambition, diſguſted every one. An attempt was even made to aſſaſſinate him; and his ſpiritual friend (Michael the archangel,

archangel, according to his own report, or the devil, according to that of the Abyſſinians) at laſt forſook him; ſo that he was carried off priſoner by a party of the rebels. After this misfortune he was much dejected, imputing it to the want of the ſpiritual aſſiſtance juſt mentioned, and which it ſeems had withdrawn itſelf ſome time before. His wife Ozoro Eſter, whom Mr Bruce characteriſes as the handſomeſt woman he ever ſaw, was in great favour with the king at the time our traveller left Abyſſinia. As the king himſelf was a handſome young man, there is no improbability in ſuppoſing with Mr Bruce, that "they were not inſenſible to each other's merits;" and as ſhe was ſometimes honoured with a *private audience*, where Michael himſelf "bore no part in the converſation," we ſhall conclude our hiſtory of this ſingular empire by a conjecture, that ſoon after Mr Bruce's departure, Michael either died by courſe of nature, he being then very old, or was cut off by his enemies; on which Tecla Haimanout, having fully ſettled the affairs of his empire, became poſſeſſed of the beautiful Ozoro Eſter, and commenced his reign with great glory.

388 eography ancient hiopia.

With regard to the geographical deſcription of ancient Ethiopia, little can be ſaid; as not even the boundaries of the empire itſelf, much leſs thoſe of the particular diſtricts which compoſed it, were known. The ancient writers, however, agreed that it was very mountainous: but they mention no mountains of any conſequence excepting Garbata and Elephas, whoſe ſituation is not well aſcertained, tho' it is generally ſuppoſed that they anſwer to the mountains of Tigré. The moſt noted cities were Axum, Napata, Premis or Premnis, Melis, Mondus, Abalis, Moſylon, Caloe, Opone, &c.

389 uſtoms of he inhabi- ants.

The nations which inhabited ancient Ethiopia have already been enumerated; and it is not to be ſuppoſed that all, or indeed any two of them, would agree in many reſpects. The ancient hiſtorians, however, give the following information. They had many laws which were very different from thoſe of other nations; eſpecially their laws relating to the election of kings. The prieſts choſe the moſt reputable men of their body, and drew a large circle around them, which they were not to paſs. A prieſt entered the circle, running and jumping like an *Ægipan* or a ſatyr. He of thoſe that were incloſed in the circle who firſt catched hold of the prieſt, was immediately declared king; and all the people paid him homage, as a perſon entruſted with the government of the nation by Divine Providence. The new-elected king immediately began to live in the manner which was preſcribed to him by the laws. In all things he exactly followed the cuſtoms of the country; he paid a moſt rigid attention to the rules eſtabliſhed from the origin of the nation, in diſpenſing rewards and puniſhments. The king could not order a ſubject to be put to death, though he had been capitally convicted in a court of juſtice; but he ſent an officer to him, who ſhowed him the ſignal of death. The criminal then ſhut himſelf up in his houſe, and was his own executioner. It was not permitted him to fly to a neighbouring country, and ſubſtitute baniſhment for death; a relaxation of the rigour of the law, with which criminals were indulged in Greece.

*Diod. Sic.* .101, 102.

We have the following extraordinary information with regard to the death of many of their kings: The prieſts of Meroè, who had acquired great power there, when they thought proper, diſpatched a courier to the king to order him to die. The courier was commiſſioned to tell him, that it was the will of the gods, and that it would be the moſt heinous of crimes to oppoſe an order which came from *them*. Their firſt kings obeyed theſe groundleſs deſpotical ſentences, though they were only conſtrained to ſuch obedience by their own ſuperſtition. Ergamenes, who reigned in the time of Ptolemy the ſecond, and who was inſtructed in the philoſophy of the Greeks, was the firſt who had the courage to ſhake off this iniquitous and ſacerdotal yoke. He led an army againſt Meroè, where, in more ancient times, was the Ethiopian temple of gold; where he put all the prieſts to the ſword, and inſtituted a new worſhip.

The friends of the king had impoſed on themſelves a very ſingular law, which was in force in the time of Diodorus Siculus. When their ſovereign had loſt the uſe of any part of his body, by malady, or by any other accident, they inflicted the ſame infirmity on themſelves; deeming it, for inſtance, ſhameful to walk ſtraight after a lame king. They thought it abſurd not to ſhare with him corporal inconveniences; ſince we are bound by the ties of mere friendſhip to participate the misfortunes and proſperity of our friends. It was even cuſtomary among them to die with their kings, which they thought a glorious teſtimony of their conſtant loyalty. Hence the ſubjects of an Ethiopian king were very attentive to *his* and their common preſervation; and therefore it was extremely difficult and dangerous to form a conſpiracy againſt him.

The Ethiopians had very particular ceremonies in their funerals. According to Cteſias, after having ſalted the bodies, they put them into a hollow ſtatue of gold which reſembled the deceaſed; and that ſtatue was placed in a niche on a pillar which they ſet up for that purpoſe. But it was only the remains of the richeſt Ethiopians that were thus honoured. The bodies of the next claſs were contained in ſilver ſtatues; the poor were enſhrined in ſtatues of earthen ware.

Herodotus* informs us, that the neareſt relations of the dead kept the body a year in their houſes, and offered ſacrifices and firſt-fruits during that time to their deceaſed friend; and at the end of the year, they fixed the niche in a place ſet apart for the purpoſe near their town.

The Ethiopians made uſe of bows and arrows, darts, lances, and ſeveral other weapons, in their wars, which they managed with great ſtrength and dexterity. Circumciſion was a rite obſerved amongſt them, as well as among the Egyptians, from very early antiquity; though which of theſe nations firſt received it, cannot certainly be known. The Ethiopian ſoldiers tied their arrows round their heads, the feathered part of which touched their foreheads, temples, &c. and the other projected out like ſo many rays, which formed a kind of crown. Theſe arrows were extremely ſhort, pointed with ſharp ſtones inſtead of iron, and dipped in the *virus* of ſerpents, or ſome other lethiferous poiſon, inſomuch that all the wounds given by them were attended with immediate death. The bows from which they ſhot theſe arrows were four cubits long; and required ſo much ſtrength to manage them, that no other nation could make uſe of them. The Ethiopians retreated fighting, in the ſame manner as the Parthians; diſcharging vollies of arrows with ſuch dexterity and addreſs whilſt they were retiring full-ſpeed, that they terribly galled the enemy. Their lances or darts were

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* *Lib* iii. 24.

of an immenſe ſize, which may be deemed a farther proof of their vaſt bodily ſtrength.

Thus far chiefly with regard to the Ethiopians who lived in the capital, and who inhabited the iſland of Meroë and that part of Ethiopia which was adjacent to Egypt.

There were many other Ethiopian nations, ſome of which cultivated the tracts on each ſide of the Nile, and the iſlands in the middle of it; others inhabited the provinces bordering on Arabia; and others lived more towards the centre of Africa. All theſe people, and among the reſt thoſe who were born on the banks of the river, had flat noſes, black ſkins, and woolly hair. They had a very ſavage and ferocious appearance; they were more brutal in their cuſtoms than in their nature. They were of a dry aduſt temperament; their nails in length reſembled claws: they were ignorant of the arts which poliſh the mind: their language was hardly articulate; their voices were ſhrill and piercing. As they did not endeavour to render life more commodious and agreeable, their manners and cuſtoms were very different from thoſe of other nations. When they went to battle, ſome were armed with bucklers of ox's hide, with little javelins in their hands; others carried crooked darts; others uſed the bow; and others fought with clubs. They took their wives with them to war, whom they obliged to enter upon military ſervice at a certain age. The women wore rings of copper at their lips.

*Diod. Sic.* p. 102.

Some of theſe people went without clothing. Sometimes they threw about them what they happened to find, to ſhelter themſelves from the burning rays of the ſun. With regard to their food, ſome lived upon a certain fruit, which grew ſpontaneouſly in marſhy places: ſome ate the tendereſt ſhoots of trees, which were defended by the large branches from the heat of the ſun; and others ſowed Indian corn and lotos. Some of them lived only on the roots of reeds. Many ſpent a great part of their time in ſhooting birds; and as they were excellent archers, their bow ſupplied them with plenty. But the greater part of this people were ſuſtained by the fleſh of their flocks.

The people who inhabited the country above Meroë made remarkable diſtinctions among their gods. Some, they ſaid, were of an eternal and incorruptible nature, as the ſun, the moon, and the univerſe; others having been born among men, had acquired divine honours by their virtue, and by the good which they had done to mankind. They worſhipped Iſis, Pan, and particularly Jupiter and Hercules, from whom they ſuppoſed they had received moſt benefits. But ſome Ethiopians believed that there were no gods; and when the ſun roſe, they fled into their marſhes, execrating him as their cruelleſt enemy.

Theſe Ethiopians differed likewiſe from other nations in the honours which they paid to their dead. Some threw their bodies into the river, thinking that the moſt honourable ſepulchre. Others kept them in their houſes in niches: thinking that their children would be ſtimulated to virtuous deeds by the ſight of their anceſtors; and that grown people, by the ſame objects, would retain their parents in their memory. Others put their dead bodies into coffins of earthen ware, and buried them near their temples. To ſwear with the hand laid upon a corpſe, was their moſt ſacred and inviolable oath.

The ſavage Ethiopians of ſome diſtricts gave their crown to him who of all their nation was beſt made. Their reaſon for that preference was, that the two firſt gifts of heaven were monarchy and a fine perſon. In other territories, they conferred the ſovereignty on the moſt vigilant ſhepherd; for he, they alleged, would be the moſt careful guardian of his ſubjects. Others choſe the richeſt man for their king; for he, they thought, would have it moſt in his power to do good to his ſubjects. Others, again, choſe the ſtrongeſt; eſteeming thoſe moſt worthy of the firſt dignity who were ableſt to defend them in battle.

390 Account of the miſſionaries.

The Jeſuit miſſionaries were the firſt who gave any information to the Europeans concerning this country; and indeed, excepting them and the late accounts by Mr Bruce, we have no other ſource of information concerning it. The miſſionaries confirm what is ſaid by the ancients, that Ethiopia is a very mountainous country. The provinces of Begemder, Gojam, Waleka, Shoa, &c. according to them, are only one continued chain of mountains. Many of them were ſaid to be of ſuch enormous height, that the Alps and Pyrenees are but mole-hills in compariſon of them. Thoſe called *Aorni* were ſaid to be of this kind; but Mr Bruce informs us, that theſe accounts are greatly exaggerated. Amongſt thoſe mountains, and even frequently in the plains, there are many ſteep and craggy rocks to be met with of various and whimſical ſhapes; ſome of them ſo ſmooth, that men and oxen are craned up to the top by means of engines: but what is moſt ſurpriſing, the tops of theſe rocks are covered with woods and meadows, full of ſprings and ſtreams of water; of the truth of which we have an atteſtation by Mr Bruce in his deſcription of Lamalmon. The moſt remarkable of theſe, according to the authors we are now ſpeaking of, is that called *Amba Geſhen*, mentioned in the courſe of this article as one of the mountains uſed for a priſon to the princes of the blood. Its top is deſcribed as only half a league in breadth, tho' it is ſaid that it would require near half a day to go round it. Kircher mentions alſo a rock which reſembles a mirror at a diſtance; though this is probably not to be depended upon.

391 Climate, &c.

The climate of Ethiopia varies, as may naturally be ſuppoſed, according to the ſituation and elevation of the ground. On the coaſt of the Red Sea, as well as the open flat parts of the country in general, the heat is intenſe, inſomuch that at Suakem, an iſland in the Red Sea, Gregory the Abyſſine relates that it was ſo great, as to excoriate any part of the body expoſed to the ſolar rays, melt hard ſealing-wax, and ſear a garment like red hot iron. In ſeveral diſtricts, however, the heat is milder that in Portugal, and in Samen the air is rather cold than otherwiſe. In ſome other provinces the winter is very ſevere, though ſnow is ſeldom ſeen. Hail indeed ſometimes falls, which reſembles ſnow at a diſtance. and Mr Bruce mentions an account of ſnow having once fallen which laſted three days, and was looked upon to be a kind of prodigy. There are frequent and violent thunders, with exceſſive deluges of rain during one part of the year, and there are likewiſe violent ſtorms of wind. The miſſionaries mention a kind of wind named *Sendo*, which, according to Gregory, may be ſeen like a ſerpent of vaſt magnitude with its head on the ground, and the body twiſted in vaſt curls up to the ſkies. This, in all pro-

392 Violent whirl-winds.

probability, is no other than that violent ſpecies of whirlwind named *Typhon*, frequent in America and other warm countries; and its being viſible is owing to the duſt which it takes up in its paſſage.

393
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us.

Modern Ethiopia, or *Abyſſinia*, as it is now called, is divided, according to Mr Bruce, into two parts, named *Tigré* and *Amhara*; though this rather denotes a difference in the language than the territory of the people. The moſt eaſterly province properly ſo called is Maſuah. It is of conſiderable length, but no great breadth; running parallel to the Indian Ocean and Red Sea, in a zone of about 40 miles broad, as far as the iſland MASSUAH. The territories of the Baharnagaſh include this province as well as the diſtricts of Azab and Habab. In the former are mines of foſſile ſalt, which in Abyſſinia paſſes current inſtead of money. For this purpoſe the mineral is cut into ſquare ſolid pieces about a foot in length. Here alſo is a kind of mint from which great profits are derived. The Habab is likewiſe called the land of the *Agaazi* or Shepherds; who ſpeak the language called *Geez*, and have had the uſe of letters from the moſt early ages. This province was formerly taken by the Turks, when the rebellious Baharnagaſh Iſaac called them to his aſſiſtance againſt the emperor Menas. From that time the office fell into diſrepute, and the Baharnagaſh at preſent has much leſs power than formerly. The province of Maſuah is now governed by a Mahometan prince or officer called a *naybe*.

Tigré is bounded on the eaſt by the territories of the Baharnagaſh, of which the river Mareb is the boundary on the eaſt, and the Tacazze on the weſt. It is about 200 miles long from north to ſouth, and 120 broad from weſt to eaſt. All the merchandiſe ſent acroſs the Red Sea to Abyſſinia, or from Abyſſinia acroſs the Red Sea, muſt paſs through this province, ſo that the governor has his choice of it as it goes along. Thus the province itſelf is very wealthy; and as the Abyſſinian fire-arms are brought from Arabia, the governors of Tigré, by purchaſing quantities of them, may eaſily render themſelves very powerful. No arms of this kind can be ſent to any perſon without his permiſſion; nor can any one buy till the governor has firſt had an offer.

Siré was ſome time ago united to Tigré, on account of the miſbehaviour of its governor; but was disjoined from it at the time Mr Bruce was in Abyſſinia, with the conſent of Ras Michael, who beſtowed the government of it upon his ſon. It is about 25 miles long, and as much in breadth. Its weſtern boundary is the Tacazze.

Samen is a very mountainous province lying to the weſtward of the river Tacazze, about 80 miles long, and in ſome places 30 broad, though in moſt it is much narrower. It is moſtly inhabited by Jews.

Begemder lies to the north-eaſt of Tigré. It is about 180 miles long and 60 broad; bounded by the river Nile on the weſt. It comprehends the mountainous country of Laſta; and there are now ſeveral ſmall governments diſmembered from it. The inhabitants are fierce and barbarous, but reckoned the beſt ſoldiers in Abyſſinia; and it is ſaid that this province with Laſta can furniſh 45,000 horſemen. It abounds with iron mines, which in Abyſſinia would be very valuable if properly managed. It is alſo well ſtored with beautiful cattle. Near the ſouth end it is cut into vaſt gullies, ſeemingly by floods, of which we have no account. This province is reckoned the great barrier againſt the incurſions of the Galla; and though they have often endeavoured to make a ſettlement in it, they have never yet found it practicable. Several of their tribes have been cut off in the attempt.

Next to Begemder is the province of Amhara, in length about 120 miles, and ſomewhat more than 40 in breadth. It is very mountainous; and the men are reckoned the handſomeſt in all Abyſſinia. In this province is the mountain or rock Geſhen, formerly the reſidence of the royal family. This province is parallel to Begemder on the ſouth; being ſeparated from it by the river Baſhilo. On the weſt it is bounded by the Nile. The river Geſhen is another boundary.

Walaka lies between the rivers Geſhen and Samba. It is a low unwholeſome province, having upper Shoa to the ſouthward. It was in this province that the only ſurviving prince of the family of Solomon was preſerved after the maſſacre by Judith, formerly mentioned; and on this account great privileges were conferred upon the inhabitants, which in ſome degree continue to this day. The governor is conſidered as an ally, rather than a ſubject, of the emperor of Abyſſinia; and to preſerve his independency, he has allowed the Galla to ſurround his province entirely, yielding them up the territory of Walaka above mentioned. Truſting to the valour of his own people, he is under no apprehenſion of his barbarous neighbours the Galla. This province is alſo remarkable for the monaſtery of Debra Libanos, where the famous Saint Tecla Haimanout, the founder of the power of the clergy, was bred.

Gojam is remarkable for having in it the ſources of the Nile. It is bounded on the north by the high mountains of Amid Amid, on the ſouth by the river Nile, on the weſt by another river named *Gult*, and on the eaſt by the river Temci; on the north-eaſt it has the kingdom of Damot. It is about 40 miles long from north to ſouth, and ſomewhat more than 20 in breadth from eaſt to weſt. It is very populous, but the men are accounted the worſt ſoldiers in Abyſſinia. There is great plenty of very beautiful cattle.

Beyond the mountains of Amid on the eaſt lies the country of the Agows; on the weſt it has Buré, Umbarma, and the country of the Gongas; on the ſouth, thoſe of Damot and Gafat; and Dingleber on the north.

Dembea occupies all the ſpace along the lake of the ſame name from Dingleber below the mountains bounding Gueſque and Kuara. Mr Bruce is of opinion, that the lake has formerly overflowed the whole of it; and the decreaſe of this lake he brings as an inſtance of the decreaſe of large pools throughout the world.

To the ſouth of Dembea is the country of Kuara, bordering on that of the Shangalla, the Macrobii of the ancients. The neighbouring countries, inhabited by the pagan ſavages, produce gold, which is introduced in plenty into this province. None is produced in the province itſelf, nor indeed does Mr Bruce mention any part of Abyſſinia where gold is naturally found. In the lower part of this country is a colony of pagan blacks named *Ganjar*; derived, according to our author, from the black ſlaves who came into the country with the Arabs after the invaſion of Mahomet. Theſe deſerting their maſters, formed the colony we ſpeak of; but it is now more increaſed by vagabonds from other parts than by the multiplication of the inhabitants themſelves.

The governor of this country is one of the great officers of ſtate: he has kettle-drums of ſilver, which he is allowed to beat through the ſtreets of Gondar; a privilege allowed to none but himſelf. This privilege was conferred upon the firſt governor by David II. who conquered the country.

The frontier countries of Nara, Ras-el-Feel, Tchelga, &c. are wholly inhabited by Mahometans, and the government of them is uſually given to ſtrangers. The country is very hot, unwholeſome, and covered with thick woods. The people are fugitives from all nations; but excellent horſemen, making uſe of no other weapon but the broad ſword; with which, however inadequate we might ſuppoſe the weapon to be, they will attack the elephant or rhinoceros.

The moſt diſtinct idea of the ſituation of the Abyſſinian provinces is to be had from the map which Mr Bruce has given of it in his 5th volume. According to this, the empire is bounded on the ſouth by a vaſt chain of mountains, extending with very little interruption from 34° to 44° E. Long. and between 8° and 9° N. Lat. In the more proſperous times it extended beyond theſe ſouthward, particularly into the kingdom of Adel; but the mountains juſt mentioned are undoubtedly to be reckoned its natural boundaries on this ſide. On the eaſt and north-eaſt it has the Red Sea, and on the ſouth-eaſt the kingdom of Adel. On the weſt and north its boundaries are leſs diſtinctly marked; having on both theſe quarters the barbarous kingdom of Sennaar, whoſe limits will no doubt frequently vary according to the fortune of war betwixt the two princes. From Arkecko, ſituated near the foot of the Baſaltes mountains, in about 15° 30′ N. Lat. it extends to near 7° N. Lat. where the mountains of Caffa, the moſt ſoutherly province of Abyſſinia, terminate. Along the coaſt of the Red Sea lie the territories inhabited by the Hazorta-Shiho, the diſtrict of Engana Shiho, and the kingdom of Dancali, including the territory of Azab and the ſalt-pits already mentioned. To the weſtward of theſe are the province or kingdom of Tigré, including the country of the Dobas, part of the kingdom of Bali, and that of Dawaro. Still farther weſt are thoſe of Sirè, Laſta, Amhara, the greateſt part of Bali, and part of Fatigar, which laſt reaches beyond the mountains. Proceeding ſtill in the ſame direction, we come to Tcherkin, Tchelga, Abargale, Salao, Begemder, Shoa, and Ifat; reckoning always from north to ſouth; Tcherkin, for inſtance, being to the northward of Tchelga, &c. Shoa extends a conſiderable way to the weſtward; ſo that, beſides Ifat, it has to the ſouth of it alſo the kingdoms of Hade and Cambut; the latter extending beyond the ſouthern ridge of mountains. To the weſtward are Ras-el-Feel, Dembea, Gojam, and Damot; and beyond theſe are the kingdoms of Dembea, Bizamo, Gooderoo, and Guraque; thoſe of Nare or Enarea and Caffa occupying the ſouth-weſt corner of the empire.

394 Climate. With regard to the climate of Abyſſinia, Mr Bruce does not mention any thing materially different from what has been already ſaid; only he gives a very particular deſcription of the rains which produce the inundation of the NILE; and of which the ſubſtance ſhall be given under that article. We ſhall therefore cloſe our account of this country with an enumeration of its products, and ſome detail of the manners and cuſtoms of the preſent inhabitants.

395 Soil and vegetable productions. The great difference of climate, owing to the vaſt extent and variety of elevation in different parts of this empire, is very perceptible in its ſoil and productions. The mountains in many places are not only barren, but altogether inacceſſible, except by thoſe who make it their conſtant practice to climb amongſt them; and even by them they cannot be aſcended without great difficulty and danger. The ſhapes of theſe mountains, as we have already had occaſion to obſerve, are very ſtrange and fantaſtical; exceedingly different from thoſe of Europe; ſome reſembling towers and ſteeples, while others are like a board or ſlate ſet up on end; the baſe being ſo narrow, and the whole mountain ſo high and thin, that it ſeems wonderful how it can ſtand. In the valleys, however, and flat parts of the country, the ſoil is exceſſively fruitful, though in the warmeſt places grain cannot be brought to perfection. Wine is alſo made only in one or two places; but the greateſt profuſion of fruits of all kinds is to be met with every where, as well as many vegetables not to be found in other countries. There is a vaſt variety of flowers, which adorn the banks of the rivers in ſuch a manner as to make them reſemble fine gardens. Among theſe a ſpecies of roſes is met with, which grows upon trees, and is much ſuperior in fragrance to thoſe which grow on buſhes. Sena, cardamom, ginger, and cotton, are likewiſe produced here in great quantities. Among the variety of rare plants to be met with in Abyſſinia, Mr Bruce particularly deſcribes the following.

396 Plants deſcribed by Mr Bruce. 1. The papyrus, the ancient material for paper; which our author ſuppoſes to have been a native of Ethiopia, and not of Egypt as has been ſuppoſed. 2. Baleſſan, balm, or balſam plant; a tree growing to the height of 14 or 15 feet, and uſed for fuel along with other trees in the country. It grows on the coaſt of the Red Sea, among the myrrh trees behind Azab, all the way to Babelmandel. This is the tree producing the balm of Gilead mentioned in Scripture. 3. The ſaſſa, myrrh, and opocalpaſum trees. Theſe grow likewiſe along the coaſt of the Red Sea. The ſaſſa or opocalpaſum is uſed in manufactures; and, according to our author, reſembles gum *adragant*, probably tragacanth. The tree which produces it grows to a great ſize, and has a beautiful flower, ſcarce admitting of deſcription without a drawing. 4. The ergett, a ſpecies of the mimoſa, is of two kinds; one called *ergete y'dimmo*, or the bloody ergett, from the pink colour of its filaments; the other *ergett el krone*, or the horned ergett, with a flower reſembling the acacia vera or Egyptian thorn. Theſe were both found on the banks of a river named *Amo*, near the great lake Dembea. 5. Enſete, an herbaceous plant, growing in Narea, in ſwampy places; but it is ſuppoſed to grow equally well in any other part of the empire where there is heat and moiſture ſufficient. It forms a great part of the vegetable food of the Abyſſinians. It produces a kind of figs, but theſe are not eatable. When uſed for food, it is to be cut immediately above the ſmall detached roots, or perhaps a foot or two higher, according to the age of the plant. The green is to be ſtripped from the upper part till it becomes white; and when ſoft, it affords an excellent food when eaten with milk or butter. 6. Kolquall, a kind of tree, only the lower part of which is woody, the upper part being herbaceous and ſucculent. The flowers are of a beautiful golden colour, and the fruit turns to a deep crimſon; ſo that the trees

make a very beautiful appearance. The whole plant is full of a very acrid and cauſtic milk. 7. Rack is a large tree, growing not only in Abyſſinia but in many places of Arabia Felix. Its wood is ſo hard and bitter, that no worm will touch it; for which reaſon it is uſed by the Arabs for conſtructing their boats. It grows, like the mangrove, among the ſalt-water of the ſea, or about ſalt ſprings. 8. Gir-gir, or geſhe-el-aube; a kind of graſs found about Ras-el-Feel, growing to the height of about three feet four inches. 9. The kantuffa, a very noxious ſpecies of thorn, much more troubleſome than any with which we are acquainted, and growing to the height of eight or more feet. The flowers have a ſtrong ſmell like the flower mignionet. 10. The gaguedi, is a ſhort tree only about nine feet high, a native of Lamalmon. The flowers, which are yellow and very beautiful, turn towards the ſun like thoſe of the helianthus. 11. The wanſey, a tree common throughout all Abyſſinia; flowers exactly on the firſt day the rains ceaſe. It grows to the height of 18 or 20 feet; having a thick bark and cloſe heavy wood; the firſt part of which is white, but the reſt of a dark colour. The flowers are of a beautiful white colour; but it does not appear to poſſeſs any other remarkable property, though it is held in great eſtimation by the Abyſſinians, and is even worſhipped by the Galla. 12. The farek, or Bauhinia acuminata, grows in the country immediately adjacent to the ſources of the Nile; being found by Mr Bruce ſcarce 400 yards diſtant from the fountain. 13. Kuara, is a beautiful tree, growing in the ſouth and ſouth-weſt parts of Abyſſinia. It has a fruit like a bean, of a red colour, which in the early ages was made uſe of as a weight for gold and diamonds; and hence Mr Bruce is of opinion that the name of the imaginary weight *carat* is derived. 14. The walkuffa, grows in the hotteſt parts of Ethiopia. It is a flowering tree, with beautiful white bloſſoms, which do not appear till towards the middle of January. The flowers have no ſmell, and are accounted pernicious to bees. The wood is very heavy. 15. The wooginoos, or Brucea antidyſenterica, is common throughout the whole empire, but principally on the ſides of the valleys. It is a ſovereign remedy againſt the dyſentery, a very common and fatal diſeaſe in hot countries. Mr Bruce had experimental proof of its antidyſenteric virtues. 16. Cuſſo, or Bankſia anthelmintica, is a very beautiful and uſeful tree, being a ſtrong anthelmintic, and uſed as ſuch by the Abyſſinians. Every perſon there, whether male or female, is troubled with that kind of worm called *aſcarides;* a great number of which are evacuated every month, and the evacuation is promoted by an infuſion of this plant. While taking this medicine, the patients ſequeſtrate themſelves from all their acquaintance, and keep cloſe at home. It is ſaid, that the want of this medicine in other countries is the reaſon why the Abyſſinians do not go out of their own country; or, if they do, that they are ſhort-lived. 17. Teff, is a kind of grain ſown generally throughout Abyſſinia; and conſtituting the bread commonly made uſe of by the inhabitants. They have indeed plenty of wheat, and are as ſkilful in forming it into bread as the Europeans; but this is only made uſe of by people of the firſt rank: however, the teff is ſometimes of ſuch an excellent quality, that the bread made from it is held in equal eſtimation with the fineſt wheat. From the bread made of this grain a ſouriſh liquor called *louza* is prepared, which is uſed for common drink like our ſmall beer. A liquor of the ſame kind, but of inferior quality, is made from barley cakes. Some have been of opinion, that the uſe of teff occaſions the worms above mentioned; but this is controverted by Mr Bruce. Nook, a plant not to be diſtinguiſhed from our marigold either in ſhape, ſize, or foliage, is alſo ſown very generally over the country, and furniſhes all Abyſſinia with oil for the kitchen and other uſes.

397 Quadrupeds. Abyſſinia abounds with a vaſt variety of quadrupeds both wild and tame. Immenſe numbers of cattle every where preſent themſelves, ſome of them the moſt beautiful in the world. Some have monſtrous horns, ſaid to be capable of holding 10 quarts each; but this, as our author informs us, is a diſeaſe which proves fatal to them. Buffalos are here met with in great numbers, and are very fierce and untractable; but there are no ſuch animals as carnivorous bulls, which have been ſaid to exiſt in this and other internal parts of Africa. Antelopes and other wild animals are met with in great numbers in the uncultivated parts; feeding chiefly on the leaves of trees. They abound moſt of all, however, in thoſe parts which have been once cultivated, but ſince deſolated by the calamities of war; and where wild oats abound in ſuch quantities as to hide them from purſuit. Hyænas, lions, foxes, jackals, wild boars, &c. are alſo found, as well as the elephant, rhinoceros, cameleopard, and others of the larger and more uncommon kinds. Great havock is made in the cultivated fields by multitudes of baboons, apes, rats, and mice. There is plenty of hares; but theſe being reckoned unclean, as well as wild boars, are not uſed as food. The rivers abound with crocodiles and hippopotami, at leaſt the Nile, and thoſe large ſtreams which flow into it: but a great number have water in them only during the rainy ſeaſon, and theſe have neither fiſh nor any animal that feeds upon them.

398 Birds. The number of birds in this country is immenſe; nor are thoſe of the carnivorous kind at all deficient. Great numbers of eagles, vultures, hawks, and others of that kind, are met with, and come punctually every year after the tropical rains have ceaſed. They feed at firſt upon the ſhell-fiſh which are met with in great quantities on the edges of the deſerts, where they had lived in the ſalt ſprings; but, being forced from their natural habitations when theſe ſprings were ſwelled by the rains, are afterwards left to periſh on dry land. When theſe fail, their next reſource is from the carcaſes of the large animals, ſuch as the elephant and rhinoceros, which are killed in the flat country by the hunters. Their next ſupply is the multitude of rats and field-mice which infeſt the country after harveſt. The vaſt ſlaughter of cattle made by the Abyſſinian armies, the multitude of perſons killed whoſe bodies are allowed to rot on the field of battle, &c. furniſh them alſo with another reſource. Theſe ſupplies, however, all fail at the beginning of the rainy ſeaſon, when the hunters and armies return home, and the vaſt quantity of water which continually overflows the ground renders it impoſſible for them to find any other food.

There are other birds which feed upon inſects, and multitudes which live on grain or ſeeds of various kinds; all of which are amply ſupplied by the immenſe quantity of fruits and berries which grow in Abyſſinia, and are ripe at all ſeaſons of the year. A very remarkable

markable particular concerning this is, that the trees which bear fruit all the year round do not carry it always in the ſame place. The weſt ſide is that which bloſſoms firſt, and where of conſequence the fruit firſt comes to perfection; the ſouth ſide ſucceeds, and goes through the ſame proceſs; after which, the north bloſſoms in like manner; and laſt of all is the eaſt ſide, which produces flowers and fruit towards the beginning of the rainy ſeaſon. All the trees of Abyſſinia are ever-green; and their leaves are of a thick leathery conſiſtence, and highly varniſhed to enable them to reſiſt the violent rains which fall during a certain ſeaſon. The granivorous birds have likewiſe this advantage, that the rains do not fall at the ſame time all over the country. It is interſected by a chain of mountains that divide the ſeaſons alſo; ſo that they have but a ſhort way to fly in order to become birds of paſſage, and ſupply themſelves with ſuch food as is neceſſary for them beyond the mountains. All the pigeons, of which there are many ſpecies, are birds of paſſage, excepting one kind. The owls are extremely large and beautiful, but few in number. There is a great variety of ſwallows, ſeveral kinds of which are unknown in Europe; but, ſays our author, "thoſe that are common in Europe appear in paſſage at the very ſeaſon when they take their flight from thence. We ſaw the greateſt part of them in the iſland of Maſuah, where they lighted and tarried two days, and then proceeded with moon-light nights to the ſouth-weſt." The large birds which reſide conſtantly among the mountains of Samen and Taranta have all their feathers tubular, the hollow part being filled with a kind of yellow duſt which iſſues out in great abundance on hunting them. This was particularly obſerved by Mr Bruce in a ſpecies of eagle which he calls the *golden eagle;* and the duſt being viewed through a microſcope with a very ſtrong magnifying power, appeared like fine feathers. The crows are ſpotted white and black, almoſt in equal proportions. The raven has his feathers intermixed with brown; the tip of his beak white, and a figure like a cup or chalice of white feathers upon his head. Our author ſaw no ſparrows, magpies, nor bats; neither are there many water fowl, eſpecially of the web-footed kind; but there are vaſt numbers of ſtorks, which cover the plains in May, when the rains become conſtant. There are no geeſe, excepting one ſpecies called the *golden gooſe* or *gooſe of the Nile*, which is common all over Africa; but there are ſnipes in all the marſhes.

399
Fiſhes.

Our author deſcribes very few fiſhes; though he ſays that an account of theſe, and other marine productions of the Red Sea, which he has painted and collected, would occupy many large volumes, and the engraving coſt a ſum which he could not by any means afford. He mentions one named *binny*, which is good food, and grows to a pretty large ſize; that from which he took the drawing being about 32 pounds weight. Its whole body is covered with beautiful ſcales reſembling ſilver ſpangles.

400
Reptiles.

401
Few ſerpents in Abyſſinia.

Of the reptiles in Abyſſinia Mr Bruce deſcribes the fly already mentioned as deſtructive to cattle, and which in his 5th volume he calls *tlatſalva*. He gives a particular deſcription of a kind of lizard, and of the ceraſtes or horned ſerpent; but denies that ſerpents are numerous in Abyſſinia, as almoſt all authors have ſuppoſed, and as we ſhould be led naturally to ſuſpect. He vouches alſo for the power that ſome perſons have of inchanting ſerpents and ſcorpions, which in ſome is natural, in others communicated artificially by certain medicines. He prevailed upon thoſe who knew the ſecret to prepare him by theſe means as they had done others; but, notwithſtanding this aſſiſtance, he acknowledges, that when it came to the trial his heart always failed him.

402
Manners, &c. of the Abyſſinians.

403
Method o ſettling th ſucceſſion to the crown de trimental to the em pire.

404
Exceſſive deſtructio by the A byſſinian armies.

*Bruce's Travels*, vol. v. p. 16

405
Immenſe number o birds whi follow them.

Mr Bruce gives an ample deſcription of the manners of the Abyſſinians, who in ſome reſpects are barbarous beyond meaſure. The continual ſtate of warfare in which they are engaged, muſt no doubt contribute to confirm them in their barbarity. That, again, according to Mr Bruce, ariſes from an error in the regulations concerning the ſucceſſion. The crown is indeed hereditary in the line of Solomon, but it depends on the miniſter to chooſe the particular perſon who is to enjoy it; and as it is always his inclination to have the government in his own hands, he never fails to chooſe an infant, who is ſeldom ſuffered to live after he comes to the years of maturity. Thus perpetual wars and commotions take place, inſomuch that the ravenous birds, as has been obſerved, find one great ſupply of food in the ſlaughters made by the Abyſſinians of one another. All authors indeed agree that the devaſtations committed by the armies of this country are exceſſive; inſomuch, that after a long encampment is removed, nothing is to be ſeen all around the place where it was but bare earth. When an army marches through the country, ſays Mr Bruce, "an inconceivable number of birds and beaſts of prey, eſpecially the former, follow it from the firſt day of its march to its return; increaſing always in proportion the more it advances into the country. An army there leaves nothing living behind, not the veſtige of an habitation; but the fire and the ſword reduce every thing to a wilderneſs and ſolitude. The beaſts and birds unmoleſted have the country to themſelves, and increaſe beyond all poſſible conception. The ſlovenly manner of this ſavage people, who, after a battle, bury neither friends nor enemies; the quantity of beaſts of burthen that die perpetually under the load of baggage, and variety of miſmanagement; the quantity of offal, and half-eaten carcaſes of cows, goats, and ſheep, which they conſume in their march for ſuſtenance; all furniſh a ſtock of carrion ſufficient to occaſion contagious diſtempers, were there not ſuch a prodigious number of voracious attendants who conſume them almoſt before putrefaction. There is no giving the reader any idea of their number, unleſs by comparing them to the ſand of the ſea. While the army is in motion, they are a black canopy which extends over it for leagues. When encamped, the ground is diſcoloured with them beyond the ſight of the eye; and all the trees are loaded with them."

406
Curious method o keeping the hyæ from the king's pa lace.

The prodigious number of criminals executed for high treaſon, whoſe bodies are cut in pieces and thrown about the ſtreets, invite the hyænas to the capital, in the ſame manner that the carrion of the camp invites the birds of prey to follow it. The method of keeping off theſe voracious animals is certainly very curious. "An officer (ſays Mr Bruce) called *Serach Maſſery*, with a long whip, begins cracking and making a noiſe worſe than 20 French poſtilions at the door of the palace before the dawn of day. This chaſes away the hyænas and other wild beaſts: this too is the ſignal for the king's riſing, who ſits in judgment every morning

ing faſting; and after that, about 8 o'clock, he goes to breakfaſt."

107 hod of nting crown- the g.

From theſe and other circumſtances we ſhould be apt to imagine that the Abyſſinians, inſtead of becoming more civilized, were daily improving in barbarity. The king is anointed at his election with plain oil of olives; "which (ſays Mr Bruce) being poured upon the crown of his head, he rubs into his long hair indecently enough with both his hands, pretty much as his ſoldiers do with theirs when they get acceſs to plenty of butter." In former times, however, matters ſeem to have been conducted with more decency. Socinios, the greateſt monarch that ever ſat on the Abyſſinian throne, was crowned, after having gained a great victory over the Galla, in a very different manner, and with the ceremonies which we are told were in uſe among the ancient kings of Tigré. At that time he had with him an army of about 30,000 men; and was beſides attended by all the great officers dreſſed in the gayeſt manner, as well as by the ladies of the firſt quality in the empire. The king himſelf, dreſſed in crimſon damaſk, with a great chain of gold about his neck, his head bare, and mounted on a horſe richly capariſoned, advanced at the head of his nobility, paſſed the outer court, and came to the paved way before the church. Here he was met by a number of young girls, daughters of the *Umbares* or ſupreme judges, together with many noble virgins ſtanding on the right and left of the court. Two of the nobleſt of theſe held in their hands a crimſon cord of ſilk, ſomewhat thicker than common whip-cord, ſtretched acroſs from one company to another, as if to ſhut up the road by which the king was approaching the church. When this cord was prepared and drawn tight about breaſt-high by the girls, the king entered; advancing moderately quick, and ſhowing his ſkill in horſemanſhip as he went along. Being ſtopped by the tenſion of the ſtring, the damſels aſked, Who he was? To this he anſwered, "I am your king, the king of Ethiopia." But they replied, "You ſhall not paſs; you are not our king." He then retired ſome paces, and again preſented himſelf. The queſtion was again put, "Who he was?" To which he anſwered, "I am your king, the king of Iſrael." But the ſame reply was ſtill given by the girls. The third time, on being aſked, "Who he was?" he anſwered, "I am your king, the king of Sion:" and drawing his ſword, he cut the cord aſunder. The damſels then cried out, "It is a truth, you are our king; truly you are the king of Sion." On this they began to ſing Hallelujah, and were joined by the whole army and the reſt of the king's attendants. Amidſt theſe acclamations the king advanced to the foot of the ſtair of the church, diſmounted, and ſat-down upon a ſtone; which, in Mr Bruce's opinion, was plainly an altar of Anubis or the Dog-ſtar. After the king, came a number of prieſts in proper order. The king was firſt anointed, then crowned, and accompanied half up the ſteps by the ſinging prieſts. He ſtopped at a hole made on purpoſe in one of the ſteps, where he was fumigated with myrrh, aloes, and caſſia: after which divine ſervice was celebrated; and he returned to the camp, where 14 days were ſpent in feaſting and rejoicing.

Ceremonies of this kind are now given over on account of the expence. Our author was informed by Tecla Haimanout, that when he was obliged to retire into Tigré from his enemies, Ras Michael had ſome thoughts of having him crowned in contempt of his enemies; but by the moſt moderate calculation that could be made, it would have coſt 20,000 ounces of gold, about 80,000 l. ſterling; on which all thoughts of it were laid aſide.

408 Manners of the Abyſſinians.

With regard to the manners of the Abyſſinians, they are repreſented by Mr Bruce as highly barbarous. Their continual warfare inures them to blood from their infancy; ſo that even children would not have the leaſt ſcruple at killing one another or grown up perſons if they were able. Many ſhocking inſtances of hardneſs of heart are related by our author in Tecla Haimanout himſelf, though otherwiſe an accompliſhed prince. Their cruelty diſplays itſelf abundantly in the puniſhments inflicted upon criminals, one of which is flaeing alive, as has been already related of Wooſheka. Cutting in pieces with a ſabre is another; and this is performed, not by executioners, whoſe employment is reckoned diſgraceful as in this country, but by officers and people of quality. So little is this thought of indeed in Gondar, the capital of the empire, that Mr Bruce happening to paſs by an officer employed in this work, who had three men to diſpatch, the officer called to him to ſtop till he had killed them all, as he wanted to ſpeak to him upon a matter of conſequence. Stoning to death is a capital puniſhment likewiſe common in this country; and uſually inflicted on Roman Catholics if they happen to be found, or upon other heretics in religion.

409 Their horrid manner of feeding.

It is not to be ſuppoſed that people who regard the lives of one another ſo little, will ſhow much compaſſion to the brute creation. In this reſpect, however, the Abyſſinians are cruel and ſavage beyond all people on the face of the earth. There are many inſtances of people eating raw fiſh or fleſh, and we call them barbarous that do ſo; but what name ſhall we give to thoſe who cut off pieces of fleſh from animals while ſtill living, and eat it not only raw but ſtill quivering with life! Mr Bruce labours much to prove, that the way of eating not raw, but *living* fleſh, was cuſtomary among the nations of antiquity: but whatever be in this, he is the only author who mentions it directly; and it is on his ſingle teſtimony that the fact is eſtabliſhed. The Jeſuits mentioned in their books, that the Abyſſinians eat raw fleſh, but not a word of of eating it in this manner; and indeed there are ſome circumſtances which he himſelf relates ſeemingly very difficult to be reconciled with known and indubitable facts. He informs us, for inſtance, that when at no great diſtance from Axum, the capital of Tigré, he fell in with three ſoldiers "driving a cow. They halted at a brook, threw down the beaſt, and one of them cut a pretty large collop of fleſh from its buttock; after which they drove the cow gently on as before." In another place he tells us, that the fleſh was taken from the upper part of the buttock; that the ſkin was flapped over the wound, faſtened with a ſkewer, and a cataplaſm of clay put over all. Now it is known to anatomiſts, that no piece of fleſh can be cut off without deſtroying a muſcle; and that the muſcles of the buttocks are ſubſervient to the motion of the legs. The Abyſſinians therefore muſt have been expert anatomiſts to know how to cut off ſuch muſcles as would allow the creature ſtill to go on; and if their repaſt had been two or three times repeated, it is plainly impoſſible that the cow could at any rate have ſtirred a ſtep. In his deſcription of their feaſts there is more conſiſtency; for there the animal is tied ſo that it cannot move: after ſtripping off the ſkin, the fleſh of the buttocks is cut off in ſolid ſquare pieces, without bones or much effuſion of blood; and the prodigious noiſe the animal makes is a ſignal for the company to ſit down to table. Every man ſits between two women, having a long knife in his hand. With this he cuts the fleſh, while the motion of its fibres is yet viſible, into pieces like dice. Theſe are laid upon pieces of bread made of the grain called *teff*, already mentioned, after being ſtrongly powdered with Cayenne pepper and foſſile ſalt. They are then rolled up like as many cartridges; the men open their mouths, ſtooping and gaping like idiots, while the women cram them ſo full of theſe cartridges, that they ſeem every moment in danger of being choked; and in proportion to the quantity their mouths can hold, and the noiſe they make in chewing, they are held in eſtimation by the company. All this time the animal bleeds but little: but when the large arteries are cut and it expires, the fleſh becomes tough; and the wretches who have the reſt to eat, gnaw it from the bones like dogs!

## END OF THE SIXTH VOLUME.

## ERRATA.

Page 281. col. 1. line penult. For *Stirlingſhire*, read *Perthſhire*.
367. col. 2. line 15. from bot. For *Barbary*, read *Barabra*. The ſame repeated line 2. from bot.
424. col. 2. Dele *Cavallo's Electricity* on the margin.
428. col. 1. line 13. from bot. For *a*, read *u*.
462. col. 2. line 4. from bot. For 74. read 73.
463. col. 2. laſt line. For 74. read 73.
471. col. 2. line 11. from bot. For "fig. 9." read "fig. 8, 9."
477. col. 1. line 30. For *B*, read *b*.
478. col. 1. line 35. Dele n° 2.
483. col. 1. margin. For Plate CLXXVIII. read Plate CLXXX.
504. col. 2. line 15. For *I*, read *T*.
510. col. 1. line 19. For *ABO*, read *ABC*, and dele "fig. 69."
527. col. 1. line 26. After the word *conductor*, read "fig. 85."
533. col. 1. line penult. For "fig. 6." read "fig. 4."

## DIRECTIONS FOR PLACING THE PLATES OF VOL. VI.

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